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AMERICAN GAS JOURNAL

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Manufactured and Natural Gas·

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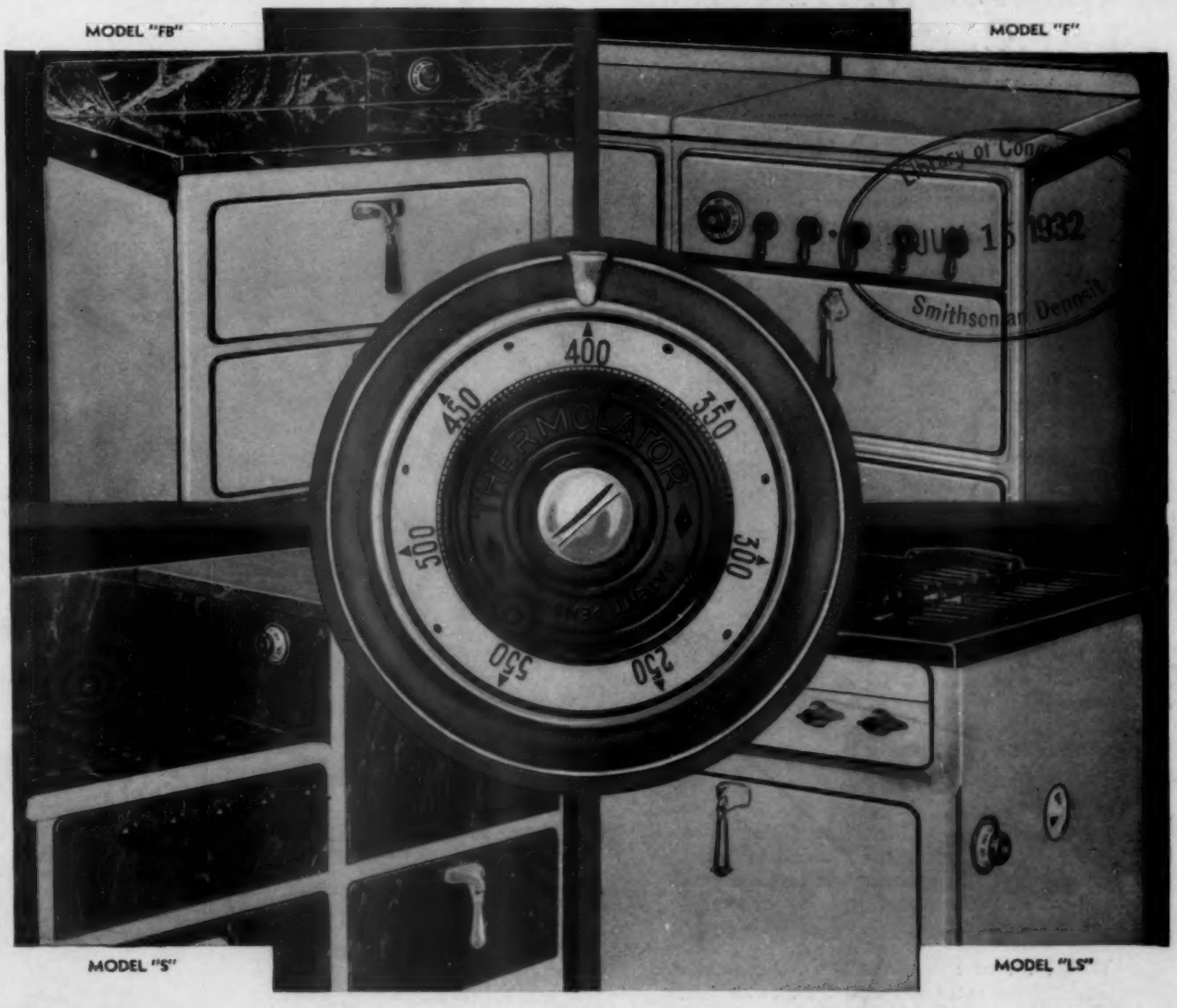

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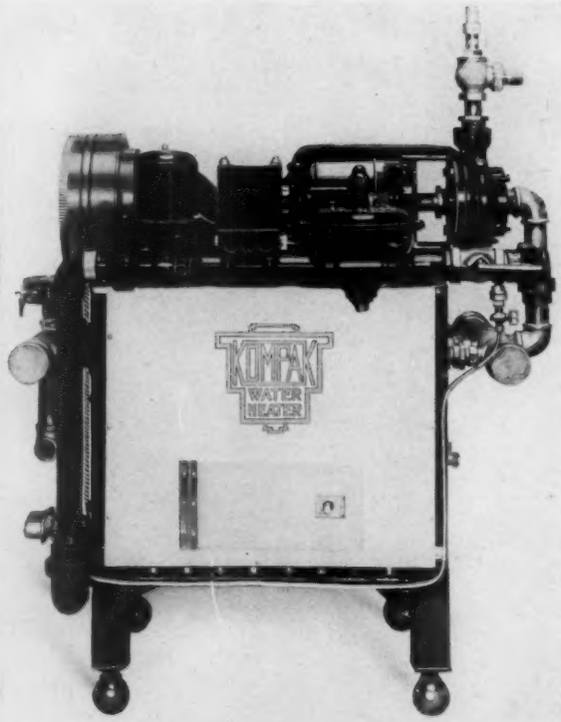

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AMERICAN
GAS JOURNAL
Established 1859 *Pioneer of the Gas Industry*

Manufactured and Natural Gas

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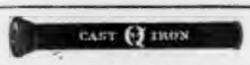

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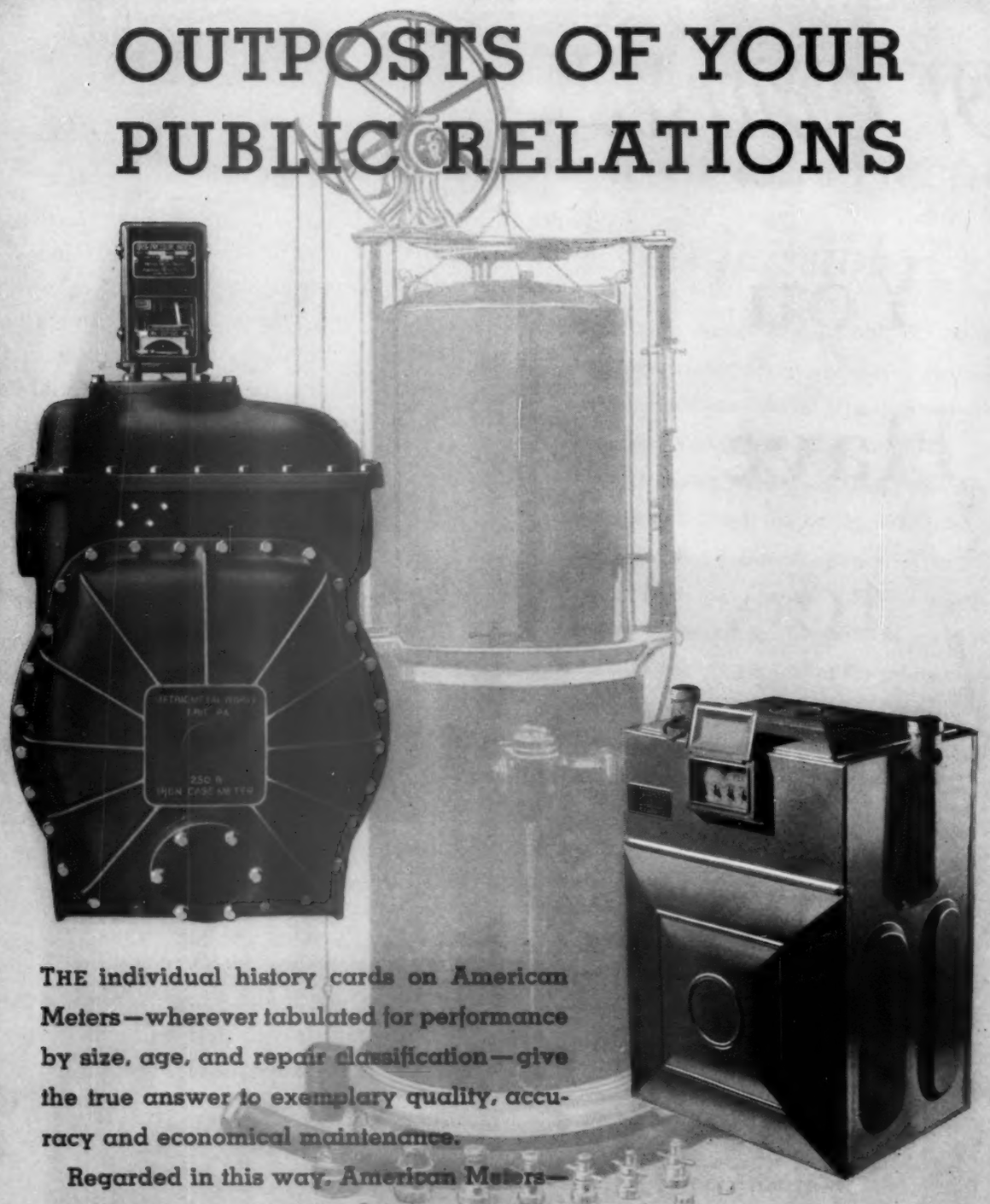

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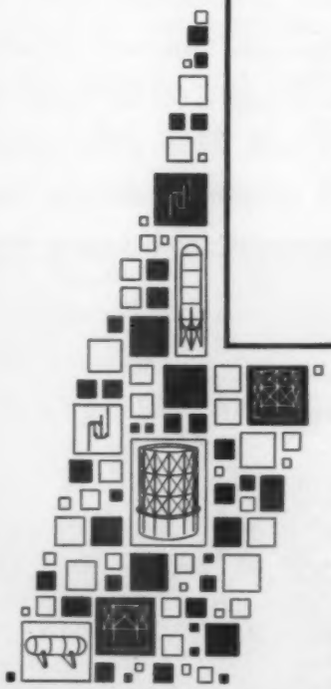

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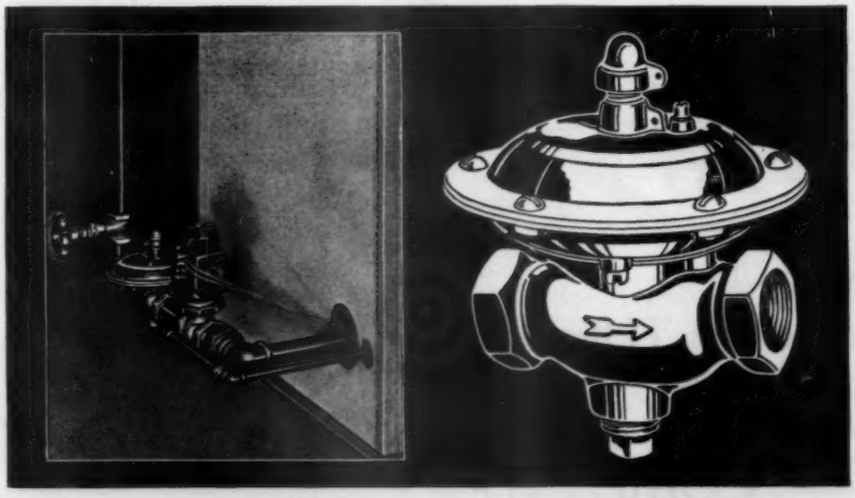

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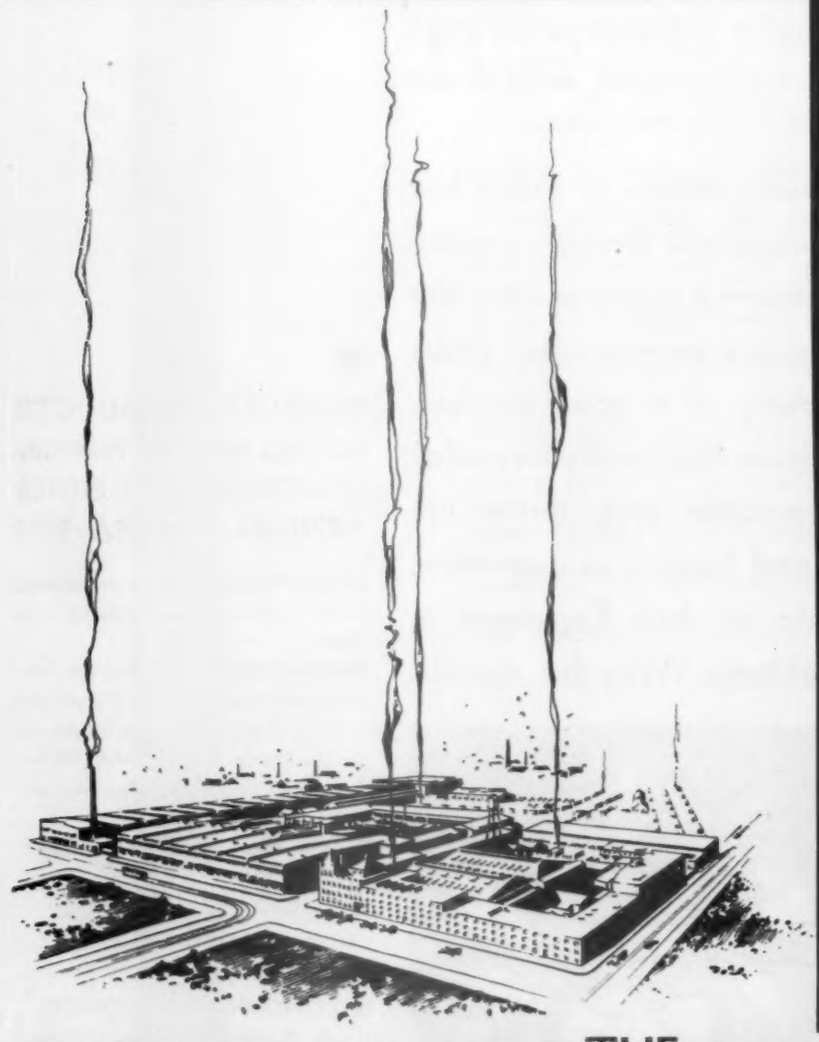

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Hayward & Friend, from an extremely modest beginning, gradually evolved, after a number of year, to The Bartlett Hayward Co., who, with its predecessors, were pioneers in the field of heating and ventilating of large buildings, in the manufacture of machine-cast iron pipe, as well as a score of other fields which since have become firmly established.

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AMERICAN
GAS JOURNAL
Established 1859 Pioneer of the Gas Industry
Including GAS INDUSTRY Est. 1900

HENRY M. RILEY, Editor

"Let's Not Be Stupid"

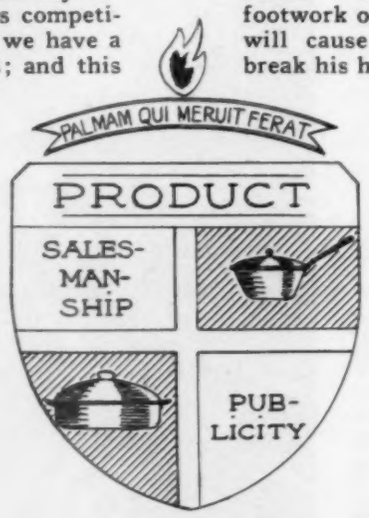
IF ONE stands on the corner long enough and shouts his wares sufficiently loud he will assuredly sell some of those selfsame goods, regardless of whether the buyers want them or indeed, ought to have them. This would appear to be the secret as to why the leather-lunged, corner-infesting gadget hawkers are able to retire early in life and send their daughters to the best finishing schools extant.

Gas men, when they collect in a body and worry about what can be done to offset the threatened invasion of the kitchen by the electric range, would do well to bear in mind the above fact. Let us reduce the matter to more direct language. If we stand idly by and permit the electric range folks to hawk their products long enough and loud enough we can be assured that these appliances will be sold—and in quantities amply large enough to jolt us into eventual but excessively expensive action. To offset this competition we must first admit that we have a selling problem on our hands; and this despite the fact that we are already in the kitchen in predominating numbers.

Obviously, the solution of any selling problem demands that the product be right from every angle, that the proper corps of salesmen be secured and lastly, that convincing publicity in the desired volume be effectively broadcast.

All of these requisites have been previously handled by gas men; they are not strange tools to our craft. Our immediate use of them will guarantee a minimum of expenditure in holding off and defeating the electric range threat. Unreasonable and stupid delay in putting them to work will involve the outlay of a maximum expenditure in recovering lost ground. It might be heartening for us to appreciate that considerably more money and effort must be put forth to get the electric range into the kitchen than to keep the gas range there. In turn we must realize that it will cost more to supplant the electric range, once it is in the kitchen, than to keep the gas range in its present envied status. Organization, headwork and footwork on our part are the things that will cause the electric range man to break his heart in a futile effort to force out a superior appliance with a relatively inferior one.

As we have previously cautioned, "Let's not be stupid."



JUN 15 1932

Cabinet in corner hides kitchen equipment when not in use

Beauty and Utility Go Hand-in-Hand in Fine Apartment

BEAUTY and utility not only meet each other, but they also live together in a most agreeable manner in the mid-New York City apartment of the "Mystery Chef," famous radio artist who has achieved a national reputation for his broadcasts on cooking.

The apartment, labelled by some decorators and home experts as the "most beautiful room in America," occupies almost the entire top floor of the building and is generally acknowledged to be both beautiful and practical. In one corner, barely taking twelve square feet of floor space, is what seems to be a handsomely carved oak cabinet. If asked, the "Mystery Chef," with a merry twinkle in his eyes, will proceed to show you how he has settled the age-old fight between beauty and utility.

He grasps a corner of this cabinet in one hand and rolls it back several feet, and one sees a compact and efficient kitchen. There is a 1932 Gas Range in combination with an Automatic Gas Refrigerator, a sink, shelf room, and plenty of "elbow room" in which to prepare the meals.

The "Mystery Chef" is himself an exceptionally fine cook, and appreciates fully the desirability of an efficient and well equipped kitchen for his own use. He has prepared every meal for his family for twenty-two years, and now he uses this kitchen which is part and parcel of his drawing room. His cooking facilities represent the kitchenette idea carried to the *nth* degree, and yet he has found the arrangement of the combination gas range and gas refrigerator extremely practicable.

The "Mystery Chef" stated that the fact that the automatic gas refrigerator operated without noise of any kind was a major consideration in selecting it for his kitchenette.

"I appreciate the flexibility of gas as a fuel, and am fully aware of the great contribution the gas range has made to the art of cooking and home making," the "Mystery Chef" stated. "I have cooked on all sorts of stoves, with all sorts of fuels, and while any cook should get uniformly good results regardless of these factors, I do feel that modern equipment is of great assistance to the average woman.

Eliminating Drudgery

"The efficient and well equipped kitchen of today relieves the home maker of certain drudgery and cares that formerly taxed her strength and wasted her energy. Today, because of modern appliances and fuels, she will find it much easier to advance in the great art of really wonderful cooking."

The development of this great art, the "Mystery Chef" says, has more to do with real happiness in the home than any other one material thing.

The "Mystery Chef" has had a phenomenal success on the radio. He broadcasts three times a week, over the Davis Baking Powder program, and during a period of six months received more than 250,000 letters from interested listeners. His booklet of recipes has been distributed to more than 275,000 persons.

The Mystery Chef is using his favorite appliance in his drawing room kitchen

Ten Years of Gas Purification

A presentation of the subject from the operator's point of view—based on records and data obtained at the Lowell plant.

R. C. DOWNING

Supt. of Mfr., Lowell Gas Light Company, Lowell, Mass.

SO much has been written on the subject of gas purification and every detail has been so fine-combed by the best technical brains of the gas industry, that it may seem irrelevant to again attempt to write about the subject. However, most of us are at times prone to overlook important facts and as a result, fundamental principles underlying important operations are neglected. Concentration of thought upon old problems after they have lain dormant is often productive of new ideas and improved operations.

It is our desire to present the subject again from the operator's point of view and to localize our efforts to a description of ten years' experience with dry purification at Lowell. During this period, fairly accurate records have been kept of batch purification, various kinds of oxides have been used and methods of operation practiced. Regular routine tests of the gas for H_2S have been made. Most of the spent oxides have been analyzed for tar and free sulphur and an attempt made to calculate their capacity, efficiency or suitability for further use. Considerable trouble was taken to compile this data into intelligent form and we feel that it should be of value to gas engineers for comparative purposes. We have found that there is a scarcity of such data published, especially of a continuous plant record of purification.

A cursory glance at our first table, No. 1, will indicate that considerable improvement in purification results has been made at Lowell during the last ten years. Such important data as the kind and amount of gas purified annually, the hydrogen sulphide content of the gas and yearly purification costs per MCF are reported. It is thought that these results, especially the low purification cost of the last five years, may stimulate sufficient interest to encourage gas production men to read the technical details which follow.

A first question to arise in a discussion of gas purification records is one which requests information as to the type of equipment used, first as to the boxes themselves, then auxiliary condensing and purification equipment and finally, the type of carbonizing or gas generating plant.

Description of Purifiers and Plant

The purifier system which was built in 1906 consists of a set of four cast iron boxes, each 40 ft.

Table No. 1—Purification Results for Ten Years

Year	Type of Material Used	Cost per M. C. F. Purified for: Material	Labor	Total	Million C. F. Gas Purified	Grains H_2S/C. F. Inlet Purifiers	Grains Left in Clean Gas	% O_2 in Gas	% Water Gas	% S. in Coal	Kinds of Coal Carbonized
1920	Canadian bog unmixed	.525c	1.153c	1.678c	845,064	290	21.2	.4	38.5	1.6	Westmoreland and Federal
1921	(To Sept. 1, Canadian bog), rusted borings	.442	3.181	3.623	773,535	240	21.2	.5	52.0	1.3	Westmoreland and Federal
1922	Rusted borings	.216	2.122	2.338	802,259	200	14.7	.6	63.1	1.6	Federal, Westmoreland and Fairmont
1923	Bog ore mixed with shavings	.340	1.160	1.500	852,994	155	18.0	.6	14.0	1.2	Elkhorn, Fairmont and Westmoreland
1924	Bog ore mixed with shavings	.356	.722	1.078	809,134	130	15.3	.6	26.5	.8	Elkhorn, Fairmont and Westmoreland
1925	Bog ore mixed with shavings	.434	.579	1.013	820,088	116	9.4	.7	23.6	.6	Elkhorn and Pittsburgh
1926	Mixture of "Y" purifying material and rusted borings	.396	.375	.771	814,143	135	10.8	1.2	16.8	.5	Elkhorn
1927	"X" purifying material	.374	.389	.763	775,584	133	8.9	1.3	26.2	.5	Elkhorn
1928	"Y" purifying material	.179	.274	.453	774,907	130	7.9	.9	28.5	.6	Elkhorn and Roda
1929	"Y" purifying material	.251	.275	.526	789,336	132	6.7	1.0	10.1	.6	Roda and Elkhorn
1930	"Y" purifying material	.171	.316	.487	791,394	160	9.4	1.1	...	.6	Elkhorn and Pittsburgh
1931	"Y" purifying material	.244	.383	.627	760,624	192	8.6	.8	...	.7	Elkhorn and Logan Chilton

by 30 ft. by 12 ft. deep with a dry seal cover of $\frac{3}{16}$" steel plate which cover is locked to the box by 28 eccentric locking devices. Gas enters the boxes at the middle through a 20" connection and divides in flow, leaving at the top and at the bottom. The bottom and middle trays are supported by cast iron standards. The trays were designed to carry a layer of oxide 3½ feet deep.

These four boxes are connected to the feeder and clean gas mains and with one another with ten double-seated, three-opening 20" C. I. valves. Coal gas and water gas are mixed in the feed main before entering the first box. The piping is so arranged that the boxes can be operated in series, in parallel, or two boxes in series in parallel with the other two boxes which are in series. It is not possible to reverse the flow. An 8" header line is connected into the inlet valve of each box for revivification in place, if this practice is desired.

For moving the purifying material and covers of the boxes, there is a travelling overhead crane of 2¼ ton capacity. The frame comprises a steel framework extending longitudinally across the building, having a length of 244 ft. and is hung by rollers from tracks carried on the roof trusses. This frame carries the 40 HP induction driving motor and the driving mechanism and operator's cage which is centrally located over the purifiers. The framework can move laterally across the building. The double-jaw, center scoop bucket is hung from the framework and can be raised or lowered or moved horizontally along the frame by means of an endless wire rope drive. The framework also supports eight four-ton triplex chain hoists which are used to raise and lower the box covers.

The building housing these purifiers is 244 feet long by 86 feet wide and 22 ft. high to the eaves. It is a brick structure on concrete foundations with terra cotta roof, supplied with four ventilators, each of which has an area of 50 sq. ft. The floor is of brick laid flat on sand with cement joints.

According to Mr. Steere's formula for gas purifiers, the above set of boxes, operating with three boxes in series on 400 grains of hydrogen sulphide per 100 cu. ft. of unpurified gas, would be capable of purifying 254,000 cu. ft. of gas per hour with divided flow through three boxes.

The cost of the boxes installed with machinery amounted to $4.38 per cu. ft. of oxide capacity and the purifying house cost amounted to $2.54 per cu. ft. of oxide. This is exceptionally high, as a modern all steel welded set of outside boxes to do the same work would cost about $1.10 per cu. ft. of oxide required. The oxide capacity of these boxes is 10 cu. ft. per MCF of gas per day, which is at least twice that required for the suitable high power oxides which are used today.

Description of the plant is not necessary here except to state that it originally consisted of a battery of ten benches of standard 14-foot horizontal through retorts and a second battery of five benches, both having 12 retorts to the bench. The conventional water gas equipment handled the variations in load. In 1922, the coal gas plant was redesigned and ten benches of ten retorts, 20' long built in the same benches by extending foundations and party walls and arches. This remodeled manufacturing installation has continued in service to the present time. The effect of the installation on the removal of sulphur from gas, especially the Congdon liquor circulation system will be discussed after consideration of the results obtained with various types of oxides.

It should also suffice to state here that the condensing system was more than adequate. Prior to the change in the retort installation, gas passed from the retorts through a turbo compressor, multitubular four-pass condenser, P. & A. Tar extractor, four cyanogen washers of the Feld centrifugal type, secondary condensers and a Livesey washer. Then it was boosted by a Mackensie exhauster through standard rotary scrubbers and finally through the purifying boxes. After the change in 1922, the gas flow was from turbo exhausters, through primary condenser, tar extractor, secondary condenser, ammonia scrubbers and then the purifiers.

Purification with Bog Ore without Shavings

Natural oxide from one of the well-known Canadian bog ore sources was used in the boxes for quite a number

Table No. II—Record of Two Years of Purification Using Bog Ore Without Mixing with Shavings

Batch No.	Date Into Box	Date Out of Box	Box No.	No. Days in Use	M. C. F. Gas	Cu. Ft. Gas per Bu.
A	12—18—1919	5—10—1920	3	143	339,435	58,930
B	1—29—1920	6— 7—1920	1	129	285,633	49,589
C	3—11—20	6—28—20	4	109	237,180	41,177
D	4— 8—20	7—26—20	2	109	206,256	35,808
E	4—12—20	8—18—20	3	128	271,127	47,071
F	6—10—20	9—15—20	1	97	190,035	32,992
G	7— 1—20	10—25—20	4	116	275,568	47,842
H	7—29—20	12— 6—20	2	136	311,639	54,104
I	8—20—20	1—10—1921	3	143	340,807	59,168
J	9—17—20	2—14—21	1	150	349,215	60,628
K	10—27—20	3— 8—21	4	132	294,626	51,150
L	12— 9—20	4—12—21	2	156	267,675	45,603
Average for 1921				129		48,672
M	1—13—1921	5—15—1921	3	122	246,825	42,851
N	2—16—21	6— 5—21	1	109	214,312	37,207
O	3—11—21	6—20—21	4	93	199,803	34,688
P	4—14—21	8— 5—21	2	113	227,073	39,422
Q	5—18—21	8— 9—21	1	93	192,191	33,366
R	6— 8—21	8—30—21	3	83	174,552	30,304
S	6—23—21	9— 8—21	4	77	163,230	28,339
T	8— 8—21	10—26—21	2	79	178,233	30,943
U	8—20—21	9—26—21	1	37	84,299	14,635
Started to use iron borings			3			
Average for 1922 (8 months)				90		32,418

One bushel of bog ore weighs 75 lbs. and contains 37% Fe_2O_3—when discarded.
30 lbs. sulphur removed per bushel of oxide = 35.6% sulphur in spent oxide.

of years prior to 1922. A three foot layer was placed on each tray without mixing with shavings. Excelsior was used between the boards to insure a uniform distribution of gas to the oxide. Gas entered at the center, passed up through one layer and down through the other. As has been previously mentioned, ammonia scrubbers and purifying boxes were the only equipment on the outlet or discharge side of the gas exhausters. This made it possible to carry a differential pressure of as high as 22" over the boxes before a change was made. Two boxes were operated in series in parallel with two other boxes. Table No. 2 shows the results of this operation for 1920 up to September, 1921 at which time the practice was stopped. It will be noted that a box was changed about every 129 days in 1920 and about every 90 days in 1921 when coals higher in sulphur content were used and more water gas made. Each box contained 5760 bushels of oxide and each bushel purified 48,672 cu. ft. of gas in 1920 and 32,418 cu. ft. in 1921. Unfortunately, no continuous records of the grains of hydrogen sulphide in the gas were kept and it is, therefore, impossible to calculate the sulphur removed from the gas per bushel of oxide by this method. However, the spent oxide analysis shows that a bushel weighed 75 lbs. dry and contained 30 lbs. or 40% by weight of sulphur. The original oxide also weighed 75 lbs. per bushel but contained about 42% water and 37% Ferric oxide. Invoices recorded that 440 tons of bog ore were purchased and used per year for each 812,500 MCF gas passed. Calculation from this data gives the hydrogen sulphide in the gas as 290 grains per 100 cu. ft.

The information which has been given indicates very poor operation. European practice, as reported by the 1925 A.G.A. Purification committee, with 16 layers of oxide ranging from 6" to 1' in thickness, is to purify from 77 to 150 MCF per bushel of raw oxide or the equivalent of 38 to 57 lbs. of sulphur per bushel of spent oxide. This is from two to three times better than the Lowell experience. Later experience with the same bog ore mixed with shavings indicated that a pound of ore was able to remove more than 3 lbs. of sulphur whereas, when used without shavings, a pound of material only absorbed .4 of a pound of sulphur before being discarded. It is believed that the divided layers and insufficient surface of the absorbing iron is the cause for the poor results. Perhaps it should be mentioned that the bog ore cemented itself very firmly together and the hard compact mass required a great amount of picking before it could be removed. This labor amounted to about 1.15c per M during a normal year's operation, such as 1920. The total cost was 1.68c per MCF pumped.

It was the practice to remove the spent oxide from the box and then discard the hardest of the lumps. After revivification for at least a month, with the usual turning, the balance of the batch was returned to the next box emptied and a sufficient quantity of new or unused bog ore added to make up the difference. This usually amounted to about 1,000 bushels. The spent oxide was practically all disposed of by shipping to chemical companies. Usually, the percentage of sulphur was above 45%. Absence of shavings makes the spent material suitable for sulphuric acid production.

This system of bog ore purification was abandoned in September 1921 and iron borings used in its place with the four boxes operated in series. Frequent sulphur stains occurred in the gas during the period of emptying boxes when the parallel system with bog ore was in use. This objectionable feature and the excessive pressure differential made the change advisable. It was also felt that reductions in the amount of labor and the number of changes would result.

Purification with Rusted Iron Borings Oxide

The record of iron boring purifications was set up as shown in table No. 3, which is self-explanatory. A batch record system was introduced in 1922 after four new batches of iron borings were made up and had been through one change. Because of previous pressure troubles and lack of experience with the boxes working in series, it was decided to limit the amount of iron per shavings to seven pounds per bushel, which when fully rusted would give about ten pounds of ferric oxide. One batch of 6,000 bushels of iron sponge was purchased, which contained eighteen pounds of iron per bushel according to the manufacturer's statement. No attempt was made to keep continuous record of the hydrogen sulphide in the gas during the years rusted borings were in use as it was thought that any method of calculating the sulphur absorbed by an oxide would be relatively inaccurate as the flow of gas through the purifiers was very irregular with the production of water gas.

Analyses of the spent oxides were made and used as an indication of what work the oxide had done. Methods of the Gas Chemists' Handbook for total sulphur, free sulphur and tar, and ferric oxide determinations were used. However, instead of using the standard Kunberger test for fouling, it was preferred to determine iron and sulphur in the spent oxide or original oxide sample and to redetermine these constituents after one fouling in the laboratory tube with hydrogen sulphide. While this procedure is somewhat longer, it overcomes objections in that a knowledge of the ratio of the total sulphur content to the total ferric oxide content is necessary to calculate the absorbtion of sulphur by the oxide.

This ratio, multiplied by the pounds of ferric oxide in a bushel of the original oxide, gives as a result the pounds of sulphur absorbed per bushel. The pounds of ferric oxide per bushel is best obtained by invoice records of the number of bushels of shavings used and pounds of iron mixed, which latter is all assumed to be ferric oxide. In case of natural or artificial oxides, a knowledge of the ferric oxide in the material as received is required in addition to the number of pounds used per bushel. This method of valuation is only useful in case a proper sample of the spent oxide can be obtained and it also calls for a uniform known volume of material to be used.

It will be noted from Table No. 3 that the iron boring oxide used absorbed from 3 to 15 pounds of sulphur per bushel or to be more explicit, from .3 to 1.2 pounds of sulphur per pound of ferric oxide. Making due allowance for the small amount of iron used per bushel, these plant tests with iron boring oxide indicated that there was still room for improvement.

When compared with later tests of natural ore and artificial preparations, one concludes that iron boring oxide is not as satisfactory. Frequent changes of boxes were necessary because of hydrogen sulphide stains on lead acetate paper at the purifier outlet and the labor required to make such changes was excessive when iron boring oxide was used.

The year 1923 may be considered as a normal year for iron boring oxide purification and it will be seen from Table 1 that the labor cost was still quite high at 1.16c per MCF purified. In passing, it should be stated that each time a box is opened, emptied, filled and closed, and

Table No. III—Purification with Rusted Iron Borings

Batch No.	Description	Used in Box No.	Days Used	M.C.F. Gas Purified	Gas Purified per Bu. per Change	Analysis of Material from Box: % Free Sulphur	% Tar and Oil	% Total Sulphur	% Fe_2O_3	% Efficiency of Fe_2O_3	Ratio TS/Fe_2O_3	Fouling Test: % Fe_2O_3	% S	Lbs. Sulphur absorbed per Bu. Calculated: Per Fouling	Cumulative Foulings
1	5760 bu.	3	82	181,232	31,464				No Tests					1.36	1.36
	7 lbs. iron per bu.	4	128	266,238	46,222			12.39	44.90	20.6	.276	41.30	16.55	1.40	2.76
	10 lb. Fe_2O_3 per bu.	1	145	330,185	57,324	13.6	6.60	13.72	47.50	26.1	.288	41.40	18.40	.12	2.88
	Cost 30c per bu.	2	215	507,169	88,050	18.26	12.60	26.50	38.35	12.31	.690	37.20	27.13	4.02	6.90
	4.07c per lb. sulphur rem.	4	272	589,544	102,351	25.76	5.60	25.40	34.50	2.65	.737	32.00	27.80	.47	7.37
			842	1,874,368	325,411	Purification Cost Per Million—85.9c									
2	5760 bu.	4	100	222,756	38,673									1.92	1.92
	Iron sponge	1	151	313,145	54,365	9.48	....	13.75	53.70	25.60	.256	49.50	20.27	1.92	3.84
	15 lb. Fe_2O_3 per bu.	2	136	315,054	54,697	14.83	10.81	22.08	44.40	43.25	.498	38.70	29.28	3.64	7.48
	Cost 27c per bu.	3	246	574,669	99,769	14.73	14.84	26.09	36.00	13.94	.725	36.00	29.10	3.52	10.90
	2.08c per lb. sulphur rem.	1	279	612,151	106,276	17.80	16.50	31.80	36.70	11.80	.868	35.00	32.90	2.10	13.00
			912	2,037,775	353,780	Purification Cost Per Million—75.3c									
3	5760 bu.	1	99	219,296	38,072									1.00	1.00
	Iron boring oxide	2	141	291,781	50,656			13.75	53.25	4.11	.260	51.00	14.41	1.60	2.60
	10 lb. Fe_2O_3 per bu.	3	121	291,386	50,588	13.26	7.46	15.80	45.00	12.60	.352	41.60	17.80	.92	3.52
	Cost 30c per bu.	4	285	660,002	114,584	17.78	20.67	27.96	29.70	5.65	.943	26.00	34.78	5.91	9.43
	3.13c per lb. sulphur rem.														
			646	1,462,465	253,900	Purification Cost Per Million—$1.10									
4	6760 bu.	2	107	235,460	40,878									1.10	1.10
	Iron boring oxide	3	165	344,938	59,885	15.47	6.83	18.88	46.30	6.28	.41	47.00	20.95	3.00	4.10
	10 lb. Fe_2O_3 per bu.														
	Cost 30c per bu.		272	580,398	100,763	Purification Cost Per Million—$2.78									
	7.32c per lb. sulphur rem.														
5	6720 bu.	3	117	237,781	35,300			13.48	56.70	25.2	.239	48.80	19.06	.239	.239
	Iron borings & bog ore	4	151	330,721	49,200	11.99	6.15	12.52	42.10	26.7	.499	33.60	15.38	.60	.499
	10 lb. Fe_2O_3 per bu.	1	193	456,752	68,900	26.97	20.47	27.52	32.95	8.8	.835	31.50	28.06	5.36	8.35
	Cost 30.0c per bu.	2	319	726,634	108,000	30.13	5.99	34.53	29.30	12.95	1.180	27.80	34.95	3.45	11.80
	2.54c per lb. sulphur rem.														
			780	1,751,888	261,400	Purification Cost Per Million—92.2c									

the oxide turned for revivification, an expense of $300 is incurred or approximately 5c per bushel handled.

The total quantity of gas purified per bushel of the boring oxide before it was discarded, varied from 100,000 cu. ft. to 354,000 cu. ft.

Purification with Bog Ore Mixed with Shavings

In order to reduce expense of purification, it was decided to mix with shavings about 200 tons of the bog ore which was on hand when the raw bog ore practice was stopped as this material had been considered almost useless by the management and was about to be hauled away to a dump. Laboratory tests showed the ore to be very efficient and to contain 65.7% of ferric oxide. A motor-operated concrete mixer was procured and the mixing very cautiously started with only eleven pounds of the material used per bushel. This precaution was taken because with the boxes operated in series, the old pressure differential of 20" of water would have been disastrous. Results of this operation were very satisfactory as will be seen from tabulated purification records in Table No. 4.

A bushel of this natural oxide mixed with shavings now purified from 400,000 to 500,000 cu. ft. per change and absorbed from 28 to 40 pounds of sulphur per bushel. The absorption ratio of sulphur to Fe_2O_3 varied from .5 to 4.0 on the same batch, indicating that usage improves the material. The oxide was discarded when the sulphur content was above 40% although the efficiency of the iron oxide in the material was still above 35% which was better than most of the iron boring oxide when new.

Table No. IV—Purification with Natural Canadian Bog Ore

Batch No.	Description of Oxide	Used in Box No.	Days Used	M.C.F. Gas Purified	Gas Purified per Bu. per Change	Analysis of Material from Box: % Free Sulphur	% Tar and Oil	% Total Sulphur	% Fe_2O_3	% Efficiency of Fe_2O_3	Ratio TS/Fe_2O_3	Fouling Test: % Fe_2O_3	% S	Lbs. Sulphur absorbed per Bu. Calculated from Oxide Tests: Per Fouling	Cumulative Foulings
6	6720 bu. bog ore					Original Material		1.19	45.00	63.5	.408	34.7	14.14		
	11 lbs. per bu.	4	151	363871	54,148	13.22	4.75	17.50	37.45	50.66	.467	29.45	22.7	3.27	3.27
	7 lbs. Fe_2O_3 per bu.	1	295	682,759	101,601	35.60	7.06	38.20	23.00	60.20	1.66	21.35	43.3	8.33	11.60
	Cost—Mixed = 25.8c/bu.	2	278	619,000	92,113	39.23	10.17	41.20	22.40	26.80	1.84	25.1	25.0	1.26	12.86
	Per pound sulphur = .93c	3	955	1,916,813	285,240	....	11.00	49.70	12.50	35.55	3.97	12.15	50.91	15.00	27.86
			1,679	3,582,443	533,102	Cost Per Million Ft. Gas Purified = 49.4c									
7	6720 bu. bog ore					Original Material		.0	43.2	74.5	.471	33.2	15.63		
	11 lbs. per bu.	3	322	715,372	106,350	13.6	11.6	13.90	38.0	33.3	.37	32.1	18.1	2.56	2.56
	7 lbs. Fe_2O_3 per bu.	4	330	750,183	111,634	29.46	5.9	34.25	22.22	45.8	1.55	21.22	38.60	8.24	10.80
	Cost—Mixed = 25.8c/bu.	1	876	1,979,986	293,620	38.31	7.7	44.42	12.78	6.7	3.48	12.14	47.11	13.50	24.30
	Per lb. sulphur rem.= 1.06c														
			1,528	3,445,541	521,604	Cost Per Million Ft. Gas Purified = 50.3c									
8	6720 bu. bog ore					Original Material		2.43	50.0	60.7	.414	33.55	13.77		
	13 lbs. per bu.	3	292	848,054	126,198	11.80	8.02	17.22	29.3	18.92	.588	26.50	18.59	4.70	4.70
	8 lbs. Fe_2O_3 per bu.	4	1,165	2,503,533	372,550	39.95	7.35	43.71	14.95	43.50	2.920	14.35	45.72	18.66	23.36
	Cost—Mixed = 26c/bu.														
	Per lb. sulphur rem.= 1.11c		1,457	3,351,587	498,748	Cost Per Million Ft. Gas Purified = 52.1c									

Promotion of Gas

Coordination of activities, cooperation of the major divisions of the industry effectively arranged through A. G. A. management will assure most complete success.

R. S. McBRIDE,
Consulting Editor, American Gas Journal

PROMOTION of gas as a modern, efficient, effective fuel is essential for the welfare of all divisions of the industry. It is just as vital for appliance builders and the companies erecting gas works as it is for the shareholder who desires dividends from an operating enterprise. The objective of all parties is the sale of more gas for a wider variety of uses on a permanently satisfactory basis.

Very diverse interests are involved; but fortunately there is no conflict of interest. Coordination and cooperation is essential; but there is no necessity for reconciling differences. There has apparently been far too little clear-cut understanding of why the interests of appliance builders, plant erectors, and operating gas companies are different. But a still more serious lack of knowledge exists in the minds of many as to why there is a common goal to be sought by all.

Coordination of efforts now being planned is essential. Fortunately it will not be difficult. Its accomplishment under the constructive and helpful influence of the A.G.A. does, however, demand a clear knowledge of the fundamental principles involved. A reviewing of those principles is therefore undertaken here.

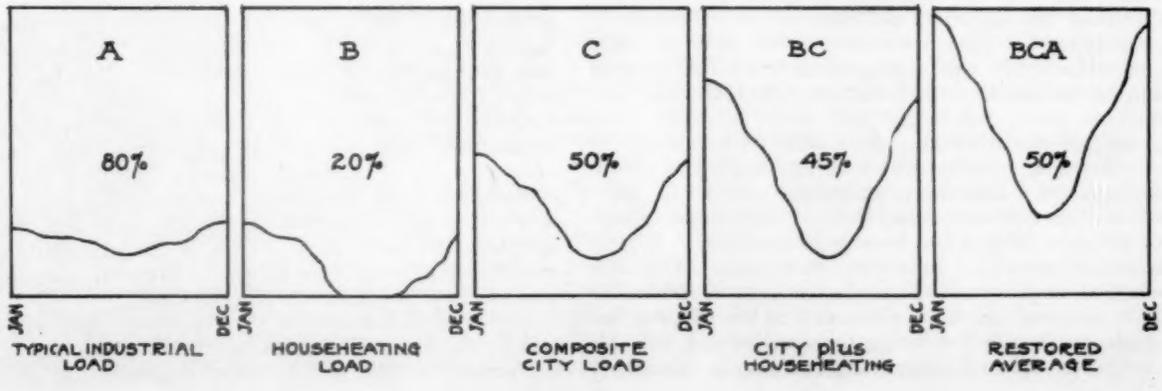
Profits for appliance builders can be expected only from the sale of large numbers of unit devices. The gas man's interest is served when the appliance begins to be a gas-consuming device. And the gas man's interest is best served when the appliance adds regularly to the consumption throughout the year.

LOAD FACTOR analysis of each type of gas use is important. Generally, the industrial gas customer has a nearly uniform requirement throughout the year. His load factor then is nearly 100 per cent. All industries together probably have at least an 80 per cent load factor. The higher this factor, the better it is for the gas man. In fact, if he could put all of his customers on a basis of as attractive a load distribution as the curve (A) which pictures the seasonal distribution of industrial gas usage, then, indeed, would the gas man's troubles be few as compared with now.

At the other end of the scale of desirability, one finds the highly seasonal house-heating load (B). In few communities is gas for house heating used more than six or seven months out of the twelve. And only a comparatively few days during the heating season is the householder compelled to run his equipment at anything like full capacity. The house-heating service load is, therefore, about a 20 per cent load factor.

A composite of all classes of gas use must be made in order to appreciate a utility system as a whole. Typically, the composite load curve (C) shows a capacity load factor for the year of 40 or 50 per cent. Let us be generous and assume that the typical well-managed company can achieve the 50 per cent basis. Incidentally, one might as well recognize that the chances of profits in the gas business very greatly increase as the capacity load factor of the system increases above 40 per cent. It is well worth while to see what is the meaning for a local enterprise of adding one class or another of business to an existing demand curve.

Suppose, first, that one adds new house-heating business. If the average send-out was formerly 10 million feet and the peak load 20 million, then the capacity-load factor was formerly the assumed 50 per cent. Now add 2 million a day to the seasonal peak. This



will add to the average send-out only one-fifth as much or 0.4 million. The capacity-load factor therefore declines to about 47 per cent; and the profit chances for the gas man decline also. Then suppose he adds a few new factory customers with almost non-seasonal loads. This is just like putting a new sound foundation under a building. Suppose he adds 2 million of such business on an 80-per cent capacity-load factor, the result is an immediate restoration of the 50-per cent average.

APPLIANCE BUILDERS have a vital concern in all this matter. Their interest is in selling large numbers of appliances. It is logical that they should expect greater advantage for themselves from the sale of 100,000 space heaters than from, let us say, 500 big industrial furnaces. There is a profit to the appliance builder from either line of business but not as much profit from the sale of a smaller number of devices, many of which have to be "specials."

One might, although falsely, conclude from this that the gas man's interest was in conflict with the appliance builder's interest. It is not actually in conflict, it is simply different. A specific plan is just now needed to take account of this difference and to coordinate the diverse, but fortunately non-conflicting, desires of the two groups. Such a plan is not impractical nor impossible of formulation. The American Gas Association, including as it does all of the divisions of the industry, has within its grasp this fine opportunity and is taking steps to make the most of it.

There are, presumably, quite a variety of ways in which to accomplish the coordination which is above suggested as essential. Each may have its distinct advantages. It is not feasible to discuss all such plans. Only one of them can be presented here. This may not be the best one but it is one which has been prepared with a clear recognition of the diversity of interests which must be brought into cooperative relationship for full success.

COOPERATION is at the basis of this program. It assumes that the present proposals of the Manufacturer's Section of A.G.A. will go forward successfully in the advertising campaign to promote modern gas cooking and the other household appliances. Such gas range campaign of advertising gives promise of great advantage directly for the appliance builders. It is very fortunate that the basis of cooperation has been so well established as to permit the formulation and prompt beginning of that effort. The appliance man's part must, however, be aggressively and most sympathetically supported by *local* sales campaigns. These must be carried out both by gas companies themselves and by all other appliance dealers, whether plumbers and gas fitters, appliance stores, or housewares divisions of the big department stores. All these appliance merchandising agencies must aid in order to make the manufacturers' advertising program a full success. It can be confidently anticipated that they will do their part.

Cooperation also will undoubtedly be given to the sales efforts of gas companies by appliance and equipment builders. Especially industrial selling is quite distinct from the merchandising of household equipment, or even of gas for household purposes. A long dissertation would be necessary to present an outline of all the principles of this industrial gas merchandising. It is enough here to point out that the cooperation of appliance builders with gas companies not only by the proposed national advertising but also in the actual development of better equipment, is likely to become an important part of a complete program.

It is surprising how many instances there are in which devices planned for one service prove adaptable to quite different usage. Of course, the household auxiliary space heater and the household water heater find many commercial, even industrial plant, applications. Sometimes we see strange diversions. Just lately, the author saw one case in which a water heater had been attached to a coal-fired house boiler and was being very successfully used for heating the home during spring and fall. Of course, the space heater designed for the home also finds a place in many a shop or industrial plant, and even the cook stove is not a stranger to many an industrial plant kitchen or manufacturing department. The big thing is to get gas into every department of every establishment. The use of gas appliances there surely follows, often more frequently than is at first thought possible.

Gas company cooperation in the gas appliance merchandising plan will insure the complete achievement of the goal set in the range advertising campaign. We are just as confident that the industrial appliance builders and those whose household equipment can be adapted to industrial uses, such as water heaters, will aid the gas companies. The spirit of cooperation in the industry has been splendidly encouraged by many years of common membership in A.G.A. Cooperation is not a new thing in this industry. Never before has it been more needed, however.

The exact machinery is still to be organized for working out the proposed industrial advertising to be done nationally by the manufacturer membership of A.G.A. Ultimately, the result unquestionably will be a closer cooperation of the Industrial Gas Section with the Manufacturers' Section. Most of the former section membership comes from gas company staffs. They will appreciate the vital part which the appliance builders have in their selling effort. They know that often industrial sales are lost because there does not exist just the appliance needed to do the job with gas most effectively. And they see many other cases in which their prospects are more or less unapproachable largely because the story of gas as a modern industrial fuel has not been effectively told by national advertising. Furthermore, I believe that in general these industrial gas salesmen keenly appreciate that they cannot expect every appliance to be a special. They know that such specials are unavoidably more expensive than standard equipment. They make sincere efforts to sell standard appliances wherever possible. Closer cooperation and full interchange of information between the two groups will lead to even more effective common effort.

COMPETITION is today one of the livest subjects of discussion in every industry. Gas executives and gas appliance builders constantly discuss it with reference to electricity. We hear much about electric ranges, even about electric water heaters for replacing those fired with gas. That competition may become very real. But strangely enough, another form of competition little mentioned, perhaps little recognized, is more vitally important to the gas man and the gas appliance builder today. This is the competition of *non-utility* gaseous-fuel supply. The real meaning of that competition deserves careful study.

Let us look forward to the conditions that will prevail in the United States some years hence, say 1940, for example. We will by then normally use about a

third more heat per year than was used on the average in the past five years. And there will be a radical difference in the proportion of that heat coming from different primary sources. Typically, in the recent past we have obtained 8 per cent from anthracite coal and 60 per cent from bituminous coal. It appears likely that in 1940 these two solid fuels will afford only 5 and 48 per cent respectively. This will represent a 10 per cent increase in total Btu. from bituminous coal, but a decline in the percentage because of the greater total energy need of a decade hence. Water power is anticipated to just about hold its own by slow expansion, furnishing approximately 6 per cent of the nation's total energy.

Petroleum and natural gas will both be largely increased sources of primary energy, advancing from 20 and 6 per cent of the recent past to 25 and 16 per cent, respectively, by 1940. Furthermore, much of the coal and petroleum, even some of the anthracite, will reach the energy user in gaseous form. Independent estimates by several thoroughly competent engineers indicate that something over 30 per cent of the entire energy supply of America will reach the user as gaseous fuel within a decade. At the present time, 16 to 18 per cent is as gaseous fuel. The gas man's job in the future is, therefore, going to be more important than ever. But —! And here is the big problem.

WHO will this gas man be? Will he be the public utility engineer and executive or will he be a non-utility purveyor of gas in tank car or truck? This is *not* an academic question. It is a very serious and a very near problem that will be largely answered by the way in which utility executives program their development work of the next five years. We hope that all this new business will be in public utility control, to the advantage of all, including the user public.

Even at the present time when we speak of the gas industry and mean the public utility man, we unduly compliment ourselves. Today, only about a third of the volume and something less than 30 per cent of the heat of available gaseous fuels in the United States is supplied to the user through public-utility systems. We cannot expect that the utility man do all of the gas supply business. Much of this gaseous fuel is used by the producer. For example, the coke-oven operator uses a substantial part of his own production in his own plant. The steel works, affiliated with the coke oven, takes another large share that cannot logically become public utility gas. But there are other great blocks of the total gaseous fuel supply of today, perhaps 25 per cent of the total, which are logically available as a public utility gas supply and which should pass through utility systems to household and industrial users. This fuel is the byproduct of petroleum refining or the byproduct of the stabilizing of natural-gas gasoline. This gaseous fuel, propane, butane, and refinery cracking still gas, represents more than three times as much energy per year as the total gas made in water gas, oil gas, and retort coal gas plants of the country. Almost none of that gas, speaking in percentages, is today merged into the utility supplies.

Some may believe that this question of competition with non-utility gas supply has nothing to do with the present program of appliance advertising. Such is not the case. Unless appliance programs are correctly planned in cooperation between utilities and appliance builders, there will inevitably grow up a new situation. These appliance manufacturers, failing to secure the full measure of active and aggressive cooperation within utility fields, are going to find other persons able to purvey non-utility gas successfully as a more promising partner in gas promotion work. It will be then absolutely necessary for the non-utility fuel man to become a promotion partner in industrial gas selling. The result will be the taking for non-utility gas the most desirable load which the utility man should have. The utility man can have that load if he will stimulate industrial appliance building and establish proper industrial gas rate structures. But he will not get the business without an effort. The effort will produce worth-while results, and we expect this effort to be put forth soon.

Oftentimes utility companies find difficulty in extending their service area rapidly enough to cover suburban additions. Supplying bottled gas to prospective customers in such territory has proven a valuable method of holding the area until extension of mains is economically warranted. Like effort should be made in holding the industrial consumer whose load characteristics are at present best cared for by liquefied petroleum gas. A utility company will purchase and distribute such gas by tank car, tank truck, or portable one-ton containers to much greater advantage in any metropolitan area than would be possible for a distant petroleum concern. It is logical that this tank gas supply should become a part of the utility business. It appears likely that the petroleum companies will be quite willing to have the gas man care for this business as it in no way fits their present retail distributing system of filling stations. Certainly it is important that utilities take account of all these possibilities and avail themselves of every extension that gives promise either of immediate profit or even of merely holding the fort for gas until main extensions or new industrial rate schedules are feasible. The objective is to coordinate all the local fuel gas supplies under utility control.

IF the gas man in the utility business should by neglect encourage a non-utility gas industry to grow up vigorously, another indirect consequence is likely to follow. This indirect consequence is of vital concern even to the gas range builder. The succession of events will be something as follows:

Suppose non-utility enterprises should take a large part of the industrial gas load in some places. (Everyone hopes that this supposition will not be realized, but it might as well be faced as a supposition.) Then the profit opportunity for the utility companies so affected would shrink. The average price to be charged for gas would then have to be raised and gas would have to compete against electricity even for household use at a material disadvantage. The inevitable consequence in a secondary way would be some increased difficulty in the selling of household gas ranges, household water heaters, and like equipment. Hence, even the household appliance builder can expect to prosper most only when the utility companies gain a large part, even dominant position, in industrial gas sales. Even the man who builds only gas ranges must, therefore, put his support back of utility campaigns even those intended only to build industrial loads. There is no conflict of interest. There is only community of interest in the further building of the utility gas industry of America.

At the present time, when several new programs for appliance merchandise are being developed, these points should be clearly in mind. It is, indeed, fortunate, that the interests of all divisions of our industry are common. It is still more fortunate that all divisions of our industry are so effectively working togeth-

(Continued on page 36)

Measurement of the Electrical Conductance of Non-Metallic Pipe Coatings

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I—Introduction

ALTHOUGH the measurement of the electrical conductance of a pipe coating may not afford a direct measure of its ability to withstand soil corrosion, this property is, nevertheless, of great importance in the study of protective coatings.

In his 1931 report to the American Gas Association, Ewing[1] states: "There is a rough relation between electrical conductance and pinhole density"; and Scott[2] in his report to the American Petroleum Institute states that electrical conductance is an important property of most protective coatings and that conductance measurements have been shown to be of considerable value in the study of protective coatings in the field.

Owing to the present interest in this subject and to the fact that several pipe line companies and coating manufacturers are experimenting with various instruments for measuring coating conductances, it seems appropriate to call attention to some of the difficulties and sources of error which are to be encountered in such measurements and to describe a simple apparatus which the Bureau of Standards has recently developed and found to be suitable for field use.

Both Ewing and Scott have discussed leakage of electric current through coatings in terms of conductance, rather than resistance. While the term resistance is perhaps more familiar to most engineers than conductance and the ohm a more commonly used unit than the mho, it is really simpler and more logical to deal with the subject in the manner adopted. Where resistances are in series they are additive and are handled most easily in terms of ohms, but where they are in parallel it becomes necessary in carrying out computations, to deal with their reciprocals or their equivalent conductances. A portion of a pipe covering under test can be considered as an infinite number of parallel paths between the pipe and the external electrode,

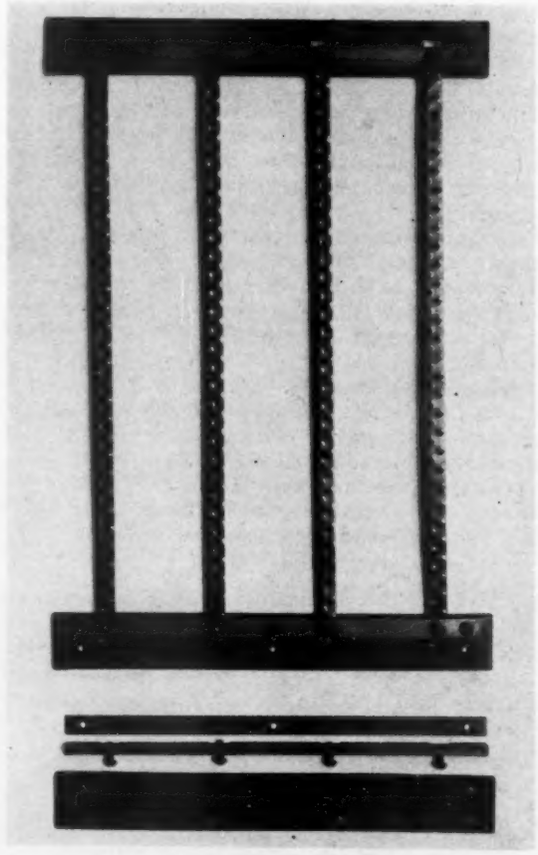


Fig. 1—Saddle Used for Measuring Pipe Coating Conductances

known as the saddle (Fig. 1). If the area is measured in square feet, then to obtain the conductance per square foot, it is only necessary to divide the total conductance observed by the number of square feet under test. Conversely, the conductance of any area is equal to the conductance per square foot multiplied by the number of square feet involved. It is not technically correct to use the term, ohms per square foot, as this implies that the resistance increases with the area. The simpler way is to deal with conductances and thereby avoid an awkward or inaccurate manner of expression.

Ewing has employed the millimho or the one-thousandth part of a mho as a unit of conductance while Scott has used the micromho or the one-millionth part of a mho. It is perhaps better to adhere to the latter unit, as it avoids small decimal values.

To get micromhos from millimhos, multiply the latter by 1,000.

To get mhos from micromhos, divide the latter by 1,000,000.

To get ohms from mhos or mhos from ohms, simply take the reciprocal of the numerical quantity involved.

II—Nature of Coating Conductance

The problem of measuring coating conductances is by no means as simple as that of measuring the conductance of a metallic circuit, or even that of an ordi-

[1] *Scott Ewing, A. G. A. Research Associate, U. S. Bureau of Standards, "A. G. A. Studies of Coatings for Pipe Lines, 1931 Convention."*

[2] *Gordon N. Scott, A. P. I. Research Associate, U. S. Bureau of Standards, "A. P. I. Coating Tests," American Petroleum Institute Bulletin No. 208, December, 1931.*

Publication Approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

nary electrolyte. In fact the behavior of many coatings is at times quite erratic and different from that of any other type of conductor encountered. Ewing[1] has discussed the nature of the conductance of coating materials and has divided it into three parts; namely, that due to large holes, that due to capillaries, and that due to inherent conductance. Although he was not entirely successful in separating these components by experimental means, he showed that the conductance due to capillaries could be changed by manipulating pressures, temperatures, and surrounding electrolytes. Since the conductance through capillaries is usually the chief component, unless the coating is ruptured, it is evident that any factor which changes or moves the electrolyte within the capillaries is likely to affect materially the total conductance of a coating. In practice such changes may be caused by evaporation from an exposed coating, temperature variations, absorption of moisture from the test pad, and even the passage of the test current. This means that the conductance of a coating is not a fixed or definite figure as is that of a wire or a solution under a given set of conditions, but is indefinite and unstable, depending upon the movement of the electrolyte within the capillary pores. When following a standard procedure in the field, these changes are not likely to be important but if a pipe is left exposed to the sun for several hours, or if a saturated pad is left on the pipe for a long time before making measurements, changes in conductance of a considerable magnitude may result.

III—Difficulties Involved in Measuring Coating Conductances

The wide range of coating conductances encountered makes the problem of field measurement particularly difficult if a single piece of rugged and simple apparatus is to be employed. Such an instrument should be capable of measuring resistances from about 10 ohms (100,000 micromhos) to 10 megohms (0.1 micromho) with a fair degree of accuracy and of indicating resistances roughly up to 100 megohms (0.01 micromho).

Since the conductance of coatings is essentially electrolytic in nature, the approved method of measuring this property would be by alternating or periodically reversed currents, in order to avoid polarization effects which are encountered when a continuous current is caused to flow through an electrolyte between electrodes.

A Wheatstone bridge in which an induction coil is used as a source of current, and a telephone receiver head set for detecting a balance, is suitable for resistances up to 10,000 or possibly to 100,000 ohms; but for higher resistances, it becomes difficult or impossible to obtain a balance. For resistances of the order of megohms, such a bridge is altogether useless. In the laboratory where 60-cycle current is available and where an a.c. galvanometer can be substituted for the telephone receiver, resistances up to a megohm or more can be measured with a fair degree of accuracy.

Capacity effects introduce another difficulty when attempts are made to use a commutating device such as the earth current meter for the measurement of high resistance coatings. A coating having an infinite resistance will show an apparent resistance R_a, as indicated in the following equation, when measured with a periodically reversed current:

$$R_a = \frac{156\,t}{A\,f\,k} \times 10^8, \text{ where}$$

t is the thickness of the coating in inches,
A, the area in square feet of the coating under test,
f, the frequency of the periodic current, and
k, the dielectric constant of the coating material.

To get an idea of the magnitude of this effect, let us assume the following constants: t = 0.05 inch, A = 2 sq. ft., f = 30 cycles per second, and k = 6. This latter value is subject to considerable variation. The value 6 is based on measurements obtained on bituminous materials in the laboratory. Substituting these values in the above equation, we find R_a, the apparent resistance of the hypothetical coating described above, to be 2.17 megohms; equivalent to 0.461 micromho.

The actual error resulting from capacity effects in any particular case will depend upon the wave form of the test current and upon the relative magnitudes of the charging current and that actually passing through the coating. It is evident from the above calculation that for thin coatings the error is quite appreciable when the resistance is of the order of megohms.

When employing test methods which involve direct current several precautions are necessary if serious errors are to be avoided. The chief sources of error are: (1) polarization, (2) galvanic potentials within the circuit, and (3) the movement of the electrolyte within the capillary pores.

In general when a direct current is passed through an electrolyte, a back or counter-electromotive force known as polarization is developed at the electrodes. There may be also an increase in the resistance between the electrodes. Both of these effects cause a decrease in the strength of the current. Polarization increases with increasing current density and, where iron electrodes are concerned, is very much greater at the cathode or negative electrode than at the anode. When measuring the conductance of a pipe coating the actual area of the pipe exposed to the action of the test current is extremely small, being only that portion on which pinhole or capillaries terminate. The other electrode of the electrolytic cell with which we are concerned is the saddle, the area of which is very large in comparison with that of the exposed portion of the pipe. If, therefore, when making a measurement the pipe is made anodic and the saddle cathodic, the current density on the cathode will be relatively low and the polarization correspondingly small; and since the polarization at the anode is inherently small, the high current density at the pipe surface is not objectionable. It is, therefore, very important always to make the pipe the anode or positive electrode when making conductance tests with direct current equipment. This principle has been definitely established by comparative tests on many specimens.

Another element related to polarization must be considered. When iron electrodes are placed in contact with most electrolytes, the ratio of the polarization voltage to the applied voltage decreases as the applied voltage is increased. It is important, therefore, to use relatively high potentials to reduce polarization errors to a minimum. Little is to be gained in going above 3 or 4.5 volts, but below 1 volt serious errors are likely to occur.

The only important galvanic potential within the test circuit, the second fundamental source of error mentioned above, is that between the saddle and the pipe. Even though the saddle material may be iron or steel, natural potentials of appreciable magnitude are often observed between it and the pipe. These potentials may be as high as 0.3 volt, but seldom higher. If therefore, this source of error is to be held within,

say 10 per cent, it will be necessary to employ a test potential of not less than 3 volts.

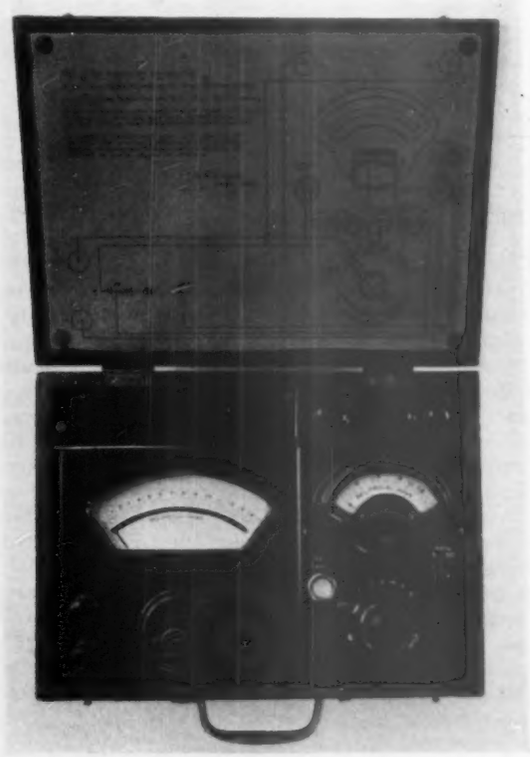


Fig. 2—Direct Current Test Set for Measuring Pipe Coating Conductances

The third source of error mentioned is that having to do with the movement of electrolyte within the capillary pores of coating materials. When a continuous current is caused to pass through a porous membrane or a porous substance such as earth or any fibrous material filled with a conducting liquid, there is a movement of the liquid in the direction of the current flow. This phenomenon is known as endosmose (or electrosmosis). This effect, or something similar to it, has been observed in a few instances when testing the conductance of coatings. It is rarely observed when using 3 volts, but becomes pronounced with 30 volts. When the saddle is made the anode and 30 volts applied between the saddle and the pipe, an increasing current is observed, an effect contrary to that of polarization. This is explained on the assumption that moisture from the pad is being carried into the capillaries of the coating material. If now the current is reversed, it diminishes rapidly and in some cases to only a small fraction of that observed when the pipe is the cathode. This, apparently, is due to the movement of the moisture out of the capillaries. If the current is continued voids are formed in the capillaries, as there is no reservoir or source of supply at the pipe surface. This effect was not very pronounced on any of the 27 sample coatings which have been in soil boxes for more than two years at the Bureau of Standards and on which recent comparative tests were made. However, on most of these samples, when using 30 volts, a lower resistance was observed when the pipe was made the cathode than when it was made the anode; while with 3 volts the lower resistance was observed when the pipe was made the anode. These results indicate that with 30 volts there is a tendency to drive the moisture from the pad into the coating and thereby lower its resistance. In general, the value which agreed best with the 60-cycle a.c. bridge measurement was that obtained by using three volts and making the pipe the anode.

Sixteen sample coatings which have been submerged in salt water for a period of months were tested by different methods and the endosmose effect was found to be much more pronounced in these than in those buried in the earth. In two instances the effect was so pronounced as to preclude the use of direct current as a satisfactory means of resistance measurement.

That the change in coating resistance brought about by the application of 30 volts to it for a short time is not the result of a breakdown or puncture, but rather due to the movement of the moisture in the pores is indicated by the results of a.c. bridge measurements given in Table 1. Column 1 shows the resistance as measured before applying 30 volts d.c.; column 2 shows the resistance as measured after applying 30 volts d.c., the pipe being made cathodic; and column 3 shows the resistance as measured on the following day. It will be seen that in every case the effect of the temporary application of 30 volts d.c. was to lower the coating resistance temporarily, but that a restoration took place by the following day.

Various attempts have been made to construct a simple test set from inexpensive instruments and materials, which will be suitable for field measurements of coating conductances. All of these employ a potential divider, whereby a variable voltage, ranging from very low to relatively high values can be obtained. The object in all such circuits is to obtain the necessary range by a wide variation in voltage, rather than by a number of instrument scales and sensitivities.

Table 1
Temporary Changes in Coating Resistances Due to the Application of 30 Volts, d.c.

	Resistance in Ohms as Measured by a.c. Bridge		
Coating.	Before applying 30 volts d.c.	After applying 30 volts d.c.	24 hours later
18	546	506	578
20	701	518	742
21	790	710	820
22	1,174	989	1,270
23	14,450	7,290	23,200
24	36,800	29,900	38,700
25	125,000	42,000	107,000

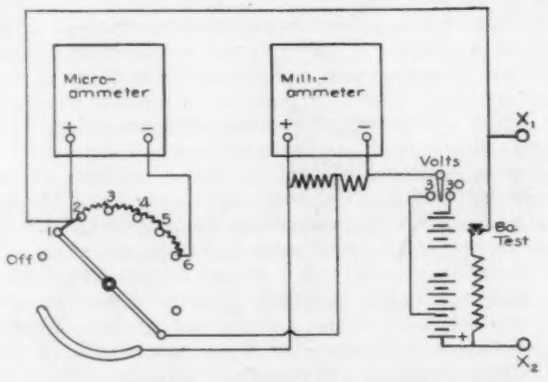


Fig. 3—Wiring Diagram of Direct Current Test Set for Measuring Pipe Coating Conductances

In addition to the inconvenience of reading two instrument scales or of setting one instrument and reading the other while the first remains at a given value, the

several sources of error discussed above are encountered with this type of apparatus. At the lower end of the potential range, as the test voltage is decreased, the polarization and galvanic potential effects become proportionally large and below one volt are so great as to introduce very serious errors in the measurements, while as the potential is increased toward 22.5 or 45 volts, as may be employed, there is danger of temporarily changing the coating resistance.

IV—Description of Direct Current Test Set for Measuring Coating Conductances

To avoid these difficulties and also those involved in a.c. measurements of this character, the author has developed a test set shown in Figures 2 and 3, by which a constant potential of 3 volts is applied to the coating under test and the necessary range is covered by a number of sensitivities on two current-indicating instruments. Resistances from about 7 ohms (150,000 micromhos) to 1,000 ohms (1,000 micromhos) are covered by two ranges on the small milliammeter shown on the right in Figure 2. The full scale ranges of this meter are 450 and 45 milliamperes, respectively. The other instrument is a microammeter having four ranges, the full scale values of resistance, conductance, and current being as follows:

Dial Point	Indicated Full Scale Values					
	Resistance	Conductance		Current		
3	667 ohms	1500	micromhos	4500	microamperes	
4	6,667 ohms	150	micromhos	450	microamperes	
5	66,667 ohms	15	micromhos	45	microamperes	
6	666,667 ohms	1.5	micromhos	4.5	microamperes	

One-tenth of full-scale deflections will indicate resistances ten times as great as those shown in the above table, or for the highest sensitivity, more than 6 megohms (0.15 micromho). A 30-volt battery is provided for the measurement of extremely high resistances where a suitable deflection cannot be obtained with three volts. This carries the range to 66 megohms and by estimating fractions of a division, to still higher values. In ordinary field practice, it is doubtful if a sensitivity greater than 0.15 micromho (6.6 megohms) will be desired.

Small inexpensive instruments are not built for such high current sensitivities, and it is therefore necessary to use a special instrument, several of which are on the market.[3]

Such instruments are slow in action as the controlling torque is necessarily small. For high resistances, this is not particularly objectionable, but for the lower ranges, where the current densities are higher, it is desirable to obtain a reading immediately after closing the circuit, to eliminate polarization errors as far as possible. For this reason, the quicker acting milliammeter is used on the lower resistance ranges.

The circuits of the test set are shown in Fig. 3. An examination of this diagram will show that on dial positions 1 and 2, the microammeter is short-circuited and that readings are obtained on the two ranges of the milliammeter. When the dial is advanced to point 3, the microammeter is put in circuit, with a low resistance shunt across it, and on higher dial positions the shunt is successively increased, thereby increasing the sensitivity of the instrument. At all times the milliammeter is in the circuit, but the deflections are too small to read except on the first two dial positions. In using the test set to measure coating conductances, it is desirable, after connecting the pipe to X_2 and the saddle to X_1, to advance the dial gradually until a suitable deflection is obtained. The actual conductance is then calculated by dividing the scale reading by 10 raised to the power indicated by the dial position.

Provision is made for checking the battery voltage so that replacements may be made as needed. Unless a battery is injured by being left on short circuit, replacements should not be required during a season.

Fig. 4—Set-up for Measuring Pipe Coating Conductances

To ascertain what accuracy could be obtained with this test set on different types of coatings and different conductances, a series of comparative tests were made on 43 coated pipe specimens which have been undergoing life tests at the Bureau of Standards for some months. Twenty-seven of these were in soil boxes and 16 in salt solutions. In all cases measurements were made between the pipe and an auxiliary electrode in the soil box or containing jar. Table 2 shows the results of these measurements. The first column gives the resistance as measured with an a.c. bridge, using 60-cycle current and an a.c. galvanometer. The second column gives the resistances as measured with the d.c. test set, using 3 volts, the pipe being anodic or positive. In the third column is given the error in per cent, referred to the a.c. bridge values as correct. It will be seen that among the 27 coatings in soil boxes, no serious errors were found. The maximum error of 20 per cent occurred with a coating of very low resistance. These errors are considerably less than the variations obtained by duplicate measurements on different days or at different points on a given length of pipe, and are well within the limit considered satisfactory for this class of work.

Among the 16 coatings in salt solutions, three were found on which satisfactory d.c. measurements could not be made, apparently because of the endosmose effect. On all others, with the possible exception of No. 30, a satisfactory agreement with the bridge was obtained.

Because of its simplicity, compactness, and ease of reading and operating, this test set appears to be well adapted to the measurement of pipe-coating conductances. Errors from polarization and galvanic potentials are well within the limits of allowable variations for this class of work.

[3] *Microammeters, having a range of from 4 to 6 microamperes and suitable for this class of work, are manufactured by The Rawson Electrical Instrument Company of Cambridge, Mass., and by the Sensitive Research Instrument Corporation, 4545 Bronx Boulevard, New York City. The latter named company recently built for a coating manufacturer a test set similar to that shown in Figure 2.*

Table 2
Comparison of a.c. and d.c. Measurements of Pipe Coating Resistances

Coatings in Soil Boxes	Resistance in Ohms by a.c. Bridge	by d.c. test set, 3 volts	Per cent error
1	14.2	17.1	+20
2	26.3	27.6	+ 5
3	31.7	35	+10
4	45.0	50	+ 9
5	54.4	58	+ 7
6	61	68	+12
7	90	91	+ 1
8	91	91	0
9	96	100	+ 4
10	112	107	— 5
11	143	149	+ 4
12	146	152	+ 4
13	198	217	+10
14	203	227	+11
15	225	232	+ 3
16	264	285	+ 8
17	514	500	— 3
18	546	625	+14
19	610	625	+ 3
20	701	770	+10
21	790	715	—10
22	1,174	1,070	— 9
23	14,450	14,600	+ 1
24	36,800	35,800	— 2
25	53,300	50,500	— 6
26	107,000	99,000	— 8
27	.....	143 megohms	
Coatings in Salt Solutions			
28	82	93	+13
29	230	264	+15
30	267	357	+34
31	267	286	+ 7
32	317	333	+ 5
33	546	625	+15
34	924	870	— 6
35	1,350	1,350	0
36	2,860	3,100	+ 8
37	17,100	19,400	+13
38	44,000	40,000	—10
39	335,000	290,000	—15
40	6.5 megohms (?)	6.2 megohms	0
41	infinite	infinite	0
42	83 to 590	indefinite	indefinite
43	16,700	50,000	indefinite

The instrument can also be used for measuring the resistance of soil samples or for the measurement of grounds or any resistance greater than 7 ohms, where a high degree of accuracy is not important.

This test set is not patented and may be constructed by any one who has the facilities for assembling the necessary apparatus.

V—Technique of Field Measurements of Coating Conductances

A detailed account of the apparatus and methods employed by Scott in making coating conductance tests in the field, as described by him in his report to the A. P. I. (see footnote on page 22) is here given:

"The elements of the electrical tests as conducted may best be explained by a description of the field procedure. A linear 1 foot section of the coating was first painted with mud of such flowing consistency as to be readily applied with an ordinary 4 in. soft paint brush. The mud was well brushed into the coating in order to fill all irregularities, such as "holidays," craters, and ruptures. * * * The pad, which consisted of three thicknesses of heavy outing flannel and which was kept in a 10 per cent salt solution when not in use, was then tightly wrapped around the coating so as to completely cover the mud. The pad was 12 in. in width. An especially designed saddle, Fig. 1, was then wrapped about the pad. The saddle was used to strap the pad to the pipe and to provide an electrical contact with the pad so that subsequent electrical circuits might be readily made and broken. The pad and saddle as well as the clamp by which electrical connection to the pipe is obtained are shown in Fig. 4.

"Six or more inches away from each end of the pad a 2-in. ring of coating was removed completely around the pipe to prevent any possibility of current leakage. * * *

"The saddle used to strap the flannel pad in place and to make electrical contact with it, was so designed as to make it adaptable to all diameter pipes. The saddle consists, briefly, of two $\frac{3}{16}$-in. bakelite strips, 12 in. long and 1½ in. in width. To each of these bakelite strips are bolted two brass strips 11⅝ in. long and ½ in. wide. Two brass strips are mounted on each bakelite strip. They are bolted to the bakelite with three flat headed screws counter-sunk on the under or pad side of the bakelite strip. The brass strip adjacent to the bakelite strip is ⅛ in. thick, and the brass strip mounted above the first brass strip is ¼ in. thick. The upper brass strip is slotted on 3 in. centers to receive four lengths of ½-in. iron box strapping. The lower brass strip is drilled at points corresponding to the slots in the upper brass strip so that the set screws which were placed at the center of each of the slotted sections would drive the flat ends of the box strapping into the drilled sections, thus holding them in place. One of the two complete members of the pair constituting the saddle has four studs on 3½ in. centers at the edge opposite the brass strips. The second member of the pair has three similar studs on 3½-in. centers staggered with respect to the four studs on the first member. The studs allowed the saddle to be tightly and rapidly affixed around the pipe when laced with a stout cord.

"In preparing the saddle for use, four equal lengths of box strapping, cut to such a length as to allow the studded edges of the saddle members to almost touch when applied around the salt pad, were inserted in the slots in the brass strips, and the set screws tightened to hold the box strapping in place. After use the box strapping was discarded, and fresh box strapping substituted as required."

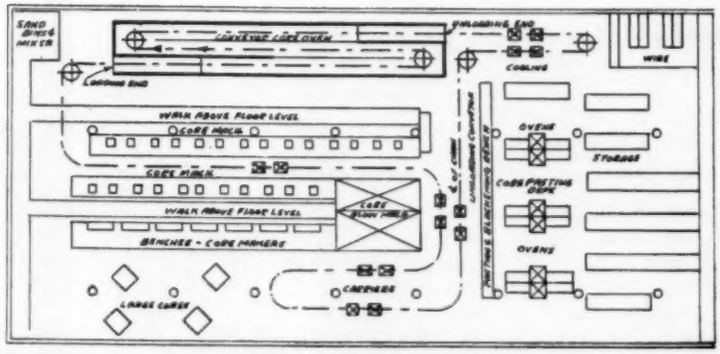
VI—Summary of Test Procedure

The following procedure should be employed in measuring pipe coating conductances in the field with direct current apparatus:

1. Make measurement soon after uncovering pipe.
2. Provide a suitable conducting medium between the coating and the metal saddle, which makes intimate contact with the coating at all points.
3. Prevent surface leakage along the coating by either cutting the coating away on both sides of the saddle or by thoroughly drying the coating surface. Only on very high-resistance coatings will the surface leakage introduce a serious error.
4. Use a voltage of not less than 3 volts and not more than 6 volts, except for very high resistance coatings. Avoid the application of sustained high voltages when making tests.
5. Connect the positive terminal of the test set to the pipe and the negative terminal to the saddle to insure a flow of current through the pad from the pipe to the saddle.
6. Read the indicating meter as quickly as possible after closing the circuit to eliminate, as far as possible, the effects of polarization and endosmose.

Industrial Furnaces For Gas

XV - Ovens for Core Baking



Plan View of Airplane Motor Foundry showing Core Machines, Loading and Unloading Sections, Core Oven and entire Conveyor System covering a Travel Distance of 700 feet.

LAWERENCE E. BIEMILLER

Supervisor Fuel Sales, Consolidated Gas, Electric Light & Power Company

BECAUSE of the great number of, and the large size of, foundries, one of the most important uses of industrial ovens is for the baking of cores. When an object is cast from molten metal the desired shape is obtained by filling an exactly formed space, with molten metal. Usually this space is obtained by a core and a mould supported in the desired relationship to each other. The core forms the interior surface of the casting, and the mould the exterior surface of the casting. Molds are made sometimes of metal, but most frequently of sand. Not many of these have to be baked to permit them to retain the exact desired shape during the casting process. Practically all cores have to be baked. They must have sufficient strength to permit them to be supported as desired and to hold the hot metal until the casting has completely cooled. They must be made of a material so that they can be disintegrated after the casting is complete, and removed from an opening of small cross-section.

Cores are made of sand mixed with some binder, in proportions such that the resulting mix can be readily formed and shaped as desired. A mixture frequently used is sand, linseed oil and water, in the proportions of about 60 to 1 to 1, by volume. Instead of oil, a flour binder, or prepared binder solution may be used. Sometimes all the sand is new, and in other cases much of the sand may be from previously baked cores. The moisture in green cores before baking is usually from 4 to 8 per cent by weight.

Two Truck-Type Ovens for baking Radiator Cores

The strength of a core is dependent upon heating to a definite temperature for a definite period of time. The time and temperature, of course, varies with the mix, and size and shape of the core. Recent research has shown that greater core strength results when the heat is transferred to the core by convection, rather than by radiation. Effective oven circulation prevents skin drying of cores.

Good castings can be obtained only when high quality cores are used. Thin walled castings or castings with intricate shapes require very exact and accurately made cores. Some castings require cores too intricate to make in one piece. In this case two or more cores may be pasted together. When a particularly smooth surface is desired on the casting, the core may receive special treatment, for example, by dipping it in a blackening solution, before or after baking. If done after baking, the core must be dried in another oven.

Core Baking in Batch Ovens

Small cores, when produced in small quantities are often baked in shelf and drawer ovens. Larger cores, when not produced in very large quantities, are likely to be baked in car or truck type ovens.

The accompanying photograph shows two of a battery of truck type ovens used for the baking of radiator cores. The core is shaped in a metal form, one-half of which constitutes a pan. The pans with green cores therein are piled upon trucks adjacent to the core makers bench. When a truck is full it is pushed to the oven so as to be ready for baking. These cores are baked for about two hours at 400° F., in which time the water is evaporated, and the linseed oil used as the binder, oxidized.

These ovens are 7 x 14 x 8 feet inside, and each one is supplied with eight drilled pipe burners, running across the oven in a combustion space about 10 or 12 inches under the oven floor. These burners have a capacity of 55,000 B.t.u. per hour, each. Gas is used at one pound pressure and all the air is injected. These ovens have a natural draft. The roof is quite high, and with clean gas fuel, the resulting working conditions in the core baking department are very good.

A slow even bake, due to evenly distributed gas heat results in practically 100% perfectly baked cores with neither green nor burnt cores.

The following is the summary of the results of a test on eight ovens of this type, baking radiator cores:

Ovens No.	Total # dry cores	Total # moisture removed	Average # dry cores per oven	Total gas consumption B.t.u.	B.t.u. gas per # dry core	Average hours of operation per oven
1 & 2.....	9,214	710	4,607	10,090,000	1,095	11.93
3, 4, 5, & 6	24,480	1,677	6,120	25,870,000	1,055	14.94
7 & 8.....	4,422	331	2,211	6,205,000	1,405	8.16

Ratio of weight of iron (trucks and core pans) to dry cores—7 to 1.

In comparing the gas used per pound of core baked it is essential that the ratio of weight of iron to weight of core be taken into consideration, as this differs greatly for different types of cores. The gas consumption, of course, would be different for the same core baked in different quantities in a different type of oven. This tabulation shows clearly the effect of longer hours of operation of an oven, as far as fuel efficiency is concerned. If ovens 1 to 6 had been operated 16 hours, they could have baked all the cores with a total fuel saving of 5 per cent, or a fuel saving on the cores baked in Nos. 7 & 8 ovens of over 25 per cent.

Core Baking in Continuous Ovens

Due to the large scale on which core baking is done, continuous ovens are very extensively used. Some of the most efficient oven installations, particularly with reference to material handling, are for core baking. In the automobile industry the large scale production of castings early necessitated the production of cores in great volume, so they turned to continuous ovens of different types. Some used external heater units, and others used a large number of individual burners.

The multiple-pass conveyor oven pictured is one of the largest core ovens in the United States. It bakes cores for automobile crank cases and the cores vary from 45 to 85 pounds. The sand used is Lake sand which is mixed with linseed oil in the ratio of 60 to 1. The oven is 200 feet long and 20 feet wide, and has four passes. Except for the cooling chamber in the foreground of the picture,—the entrance and the exit inclines,—the oven stands 17 feet above the main foundry floor. This permits the floor area (8½ foot clearance) beneath the oven for core making equipment, core dipping, core loading, unloading, sorting, fitting, inspection and storage. The cores are baked at temperatures varying from 375 to 500 F, after being dipped in plumbago blackening solution.

The oven conveyor is 812 feet long, and travels at the rate of 30 inches per minute normally. Racks are on 5' 4" centers, each rack carrying 12 cores. The normal circuit of the conveyor consists of 4 hours baking, 58 minutes cooling, 18 minutes loading and unloading, and 8 minutes idle. The very small amount of idle, loading, and unloading time, is due to a very efficient system of auxiliary conveyors.

There are 4 heat zones, one for each pass, set to maintain automatically temperatures of 515, 470, 470, and 450 F., respectively. Twenty-four burners used gas at low pressure, and air at one pound, proportionally mixed. When producing 38,000 pounds of core saturated with blackening solution per hour, and heating 16,000 pounds of core plates and racks, the gas used is equivalent to 3,000,000 B.t.u. per hour. An eight horse power motor drives the 4000 c.f.m. cooling fan. This oven is mechanically exhausted. There is a counterflow of air with respect to the progress of the work, due to the pressure built up at the exit end of the oven by the cooling fan.

Multiple-Pass Conveyor Oven used for baking Crank Case Cores

The following are performance figures for several continuous oven installations:

1. Single chain 2 pass sealed end oven, 40' x 6' x 8' 15,772 # green core, and 47,109 # metal in 10 hours; gas consumption 310 B.t.u. per pound green core.
2. Single chain 3 pass horizontal oven, 200' x 16' x 11' 10,700 # green core, and 46,650 # metal per hour; gas consumption 286 B.t.u. per pound green core.
3. Two pass vertical oven, 7½' x 10' x 38' 3,000 # green core, and 30,000 # metal per hour; gas consumption 470 B.t.u. per pound green core.
4. Three pass horizontal oven 117' x 16' x 8' 6,000 # green core, and 38,000 # metal per hour; gas consumption 600 B.t.u. per pound green core.
5. Three pass horizontal oven 128' x 14' x 8' 12,000 # green core and 25,000 # metal per hour; gas consumption 500 B.t.u. per pound green core.

These show the large capacities and low fuel consumptions possible with continuous core ovens, but they cannot show that very important item of oven expense, the cost of handling the green and finished cores.

The large economies resulting from continuous ovens are a result of correct layout of oven and other equipment pertaining to core baking. The accompanying plan view of an airplane motor foundry shows a typical efficient layout of core making and handling equipment, in relationship to the oven in which the cores are baked. The line of conveyor travels on an inclined track so that the empty shelf is always available to the operators along the line at the same loading level. The carriers enter the oven through a bottom heat seal, then are conveyed through the heating section in three horizontal passes for a bake of 3 hours at 470° F. The carriers are then discharged from a bottom heat seal, and follow a line of travel through the cooling zone and finally to the unloading benches.

Water Vapor in Natural Gas

C. H. M. BURNHAM
Vice-Pres. Colorado-Wyoming Gas Company

MIXTURES of gases and vapors, especially those consisting of air and water vapor, have for some time been the subject of considerable study. The United States Weather Bureau has given this subject much attention and has prepared tables and empirical formulas for the ready solution of certain problems relative to the earth's atmosphere.

Any space is saturated when in contact with a liquid. Imagine an evacuated space over a liquid. The liquid will evaporate, due to the vapor tension or vapor pressure, until a point of equilibrium is reached wherein as much vapor is going back into liquid form as is being vaporized. The vapor will then be of constant density. The pressure exerted by the vapor upon the walls of the container is known as the vapor pressure and is dependent only upon the temperature, as is also the density. A decrease in temperature will be accompanied by some condensation. Therefore, the vapor is said to be saturated.

Statement of Dalton's Law

The above involves the law of partial pressures sometimes referred to as Dalton's Law, which states: "When two or more gases are present in a gaseous mixture of definite volume, the pressure of the gaseous mixture is equal to the sum of the pressures that would be exerted were each one present alone in the same volume at that temperature." It follows that the pressure exerted by each gas in the mixture is in proportion to the relative volume occupied by that particular gas or vapor, the sum of these pressures being equal to the total absolute pressure on the mixture.

If we consider a special case of Dalton's Law; viz. as applied to a mixture of a gas and a vapor—for instance, natural gas and water vapor, the above may be expressed as follows:

$$\frac{V_w}{V_m} = \frac{P_w}{P_m}$$

or

$$\frac{V_m - V_w}{V_m} = \frac{P_m - P_w}{P_m}$$

in which V_w is the partial volume occupied by the water vapor and V_m the actual volume of the mixture. (The term "actual" is used here and will be used hereinafter to distinguish the volumes referred to from equivalent volumes reduced to some standard condition of pressure and temperature. An actual cubic foot is a dimensional cubic foot.) P_w and P_m are the partial pressure on the vapor and the total pressure on the mixture, respectively.

Considering saturated solutions, since the pressure on the water vapor depends only upon the temperature of the gas-vapor mixture, it follows that the weight of water vapor per cubic foot also depends only on the temperature and not upon the presence of any large or small quantity of gas. One thousand actual cubic feet of space containing saturated natural gas at 200-lb. pressure contains the same quantity of water vapor as 1,000 cu. ft. at atmospheric pressure, the temperature being the same. If the 1,000 cu. ft. of gas at 200-lb. pressure be expanded to a pressure of 14.4 lb., the water carrying capacity is increased in proportion; and, conversely, if 1,000 cu. ft. of saturated gas at atmospheric pressure be compressed to 200-lb. gauge, the weight of the water vapor must decrease.

Water Vapor in Natural Gas

It has long been known that natural gas contains varying amounts of water vapor, and since the inception of the natural gas industry it has been necessary to install pockets in the pipe lines, commonly referred to as drips, in which the condensation may collect to be periodically drained off.

While the presence of water vapor in natural gas *as a vapor* is not undesirable except, possibly, as a diluent; however, once it condenses, trouble and losses of no inconsiderable extent result to the gas companies. The three principal causes are: first, the freezing of this water in the pipe lines and regulators, bringing about serious interruptions of service; second, in the removal of this condensate from the drips large quantities of gas are blown into the atmosphere yearly; and, third, the reduction of line capacity due to accumulations of water in low places not provided with drips constitutes an item of no little expense.

Natural gas when in the presence of water literally "absorbs" water vapor, the quantity taken up depending upon the volume and temperature. After a condition of equilibrium or constant density is reached, any decrease in temperature will be accompanied by more or less precipitation. Therefore, the mixture is said to be saturated and the temperature is referred to as the "dew point." But precipitation will also take place in the event the pressure on the mixture is increased, for a decrease in volume also takes place, resulting in an increase of the partial pressure on the water vapor. Conversely, an increase in volume follows a decrease in pressure and the dew point is lowered since the weight of water vapor per cubic foot of space has decreased, due to the increased volume occupied. In other words, the warmer the gas and the lower the pressure, the more water vapor it will pick up (provided the water is available); and the lower the temperature and the higher the pressure, the less is the water which the gas can carry.

Other Vapors in Natural Gas

But there are vapors in natural gas other than water vapor. These are the natural gasoline and bottled gas constituents, and whether or not the removal of these gasoline vapors causes, indirectly, the precipitation of water in the pipe lines has been the subject of some discussion and speculation.

Relative to the effect of removing these gasoline vapors upon the dew point, and referring again to Dalton's Law, let us assume an exaggerated condition—

Read before convention of Natural Gas Dept., A. G. A., Tulsa, Okla., May 9-11, 1932.

for instance, that the gas is 50% methane, 25% gasoline vapor, 25% water vapor, and that the pressure is 200 lbs. absolute. The effective or true pressure exerted by the methane, according to this law, is 100 lbs.; by the gasoline vapors, 50 lbs.; and by the water vapor, 50 lbs. Suppose, then, that the gasoline is removed. The resulting mixture will consist by volume of 66⅔% methane and 33⅓% water vapor, and since the total pressure still remains 200 lbs. per sq. in., the pressure exerted by the water vapor will have increased to 66⅔ lbs., and by the methane to 133⅓ lbs. This effective pressure increase on the water vapor due to the removal of gasoline, while by no means as great as in the foregoing assumed example, is sufficient in many cases to cause some condensation, usually in the absorbers.

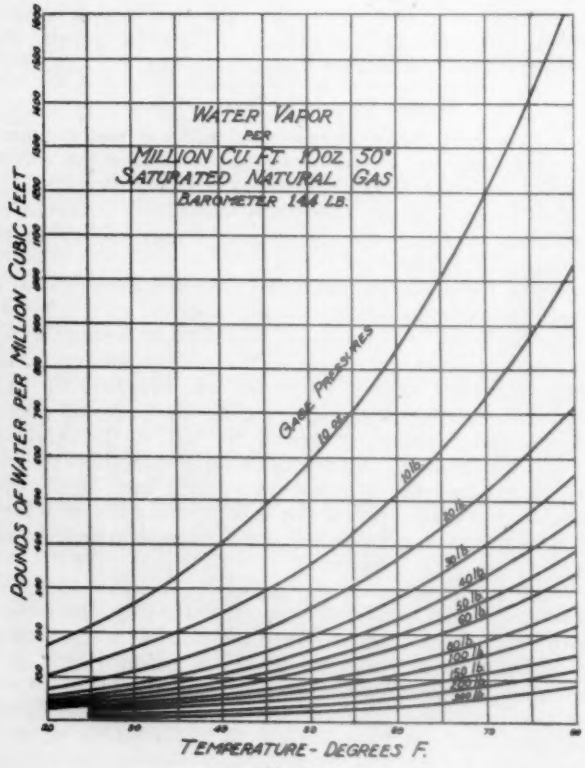


Figure 1

However, there is probably a greater reason than the one mentioned in the preceding paragraph why gasoline absorption plants are looked upon suspiciously as the cause of freeze-ups in the natural gas main lines during cold weather. The absorbing oil, it is known, contains water in appreciable quantities. This oil is circulated through the absorbers, brought intimately in contact with the gas and both are more or less warmed through the effect of the heat of absorption. If the gas does not already contain all the water vapor it can carry, quite likely it will very soon reach that condition, the amount of water vapor depending upon the pressure and temperature in the absorbers.

So it is seen that there exists in the gasoline absorption plant two opposing conditions: first, the removal of gasoline tends to precipitate water; and second, being literally washed with water, the gas absorbs water vapor until saturated. Regardless the source of the water there is one point that one can be assured of; viz., at the pressure and temperature at which it leaves the absorbers, the gas, generally speaking, is saturated with water vapor.

To show these relations of pressure and temperature to the water-carrying capacity of natural gas, three sets of curves have been prepared.

Graphic Representation

Referring to Figs. 1 and 2, the ordinates represent the pounds of water in vapor form in one-million cu. ft. of natural gas, (at 10-oz. pressure and 50° F.,) corresponding to the gauge pressure marked on each curve, and to the temperature in degrees F. on the abscissa. By use of these saturation curves, the amount of water in a saturated gas under given conditions can be quickly approximated. For instance, at 10, 20, 30, 40, 50, 100, 200, 300, 400, 500, 600, 700, and 800 lbs. pressure and 70° F., a million cu. ft. of 10 oz.—50° natural gas contains 733, 520, 403, 329, 278, 156, 83, 57, 42, 35, 29, 25, and 22 lbs. of water vapor, respectively.

At 40, 50, 60, 70, and 80° F. and 200-lb. pressure, the respective water contents are 28, 41, 59, 83, and 116 lbs. per million cu. ft.

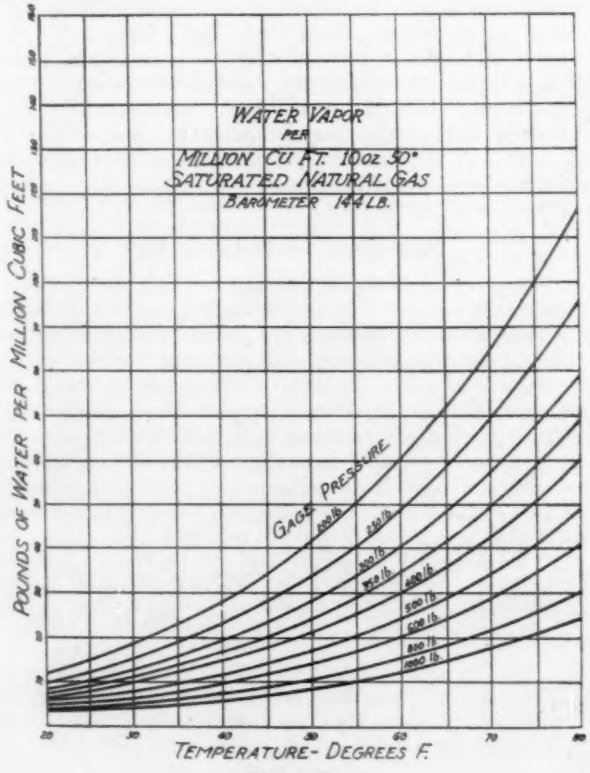


Figure 2

A general inspection of the curve on Fig. 1 reveals a point of interest; viz., that at low temperatures and high pressures a change either in pressure or temperature is accompanied by a relatively small change in the water content. On the other hand, at low pressures and high temperatures a small change either in pressure or temperature brings about a change in the water content that is quite appreciable.

Fig. 3 has similar information, but is plotted in a different manner, the ordinates representing the total gauge pressure on the gas above 14.4 lbs. absolute pressure.

The curves of Fig. 3 contain the particular information in which those concerned with the transmission of gas in pipe lines are interested; viz., it shows for a given water vapor content, the value to which the pressure on the gas must drop in order to avoid the condensation of water vapor accompanying a reduction in

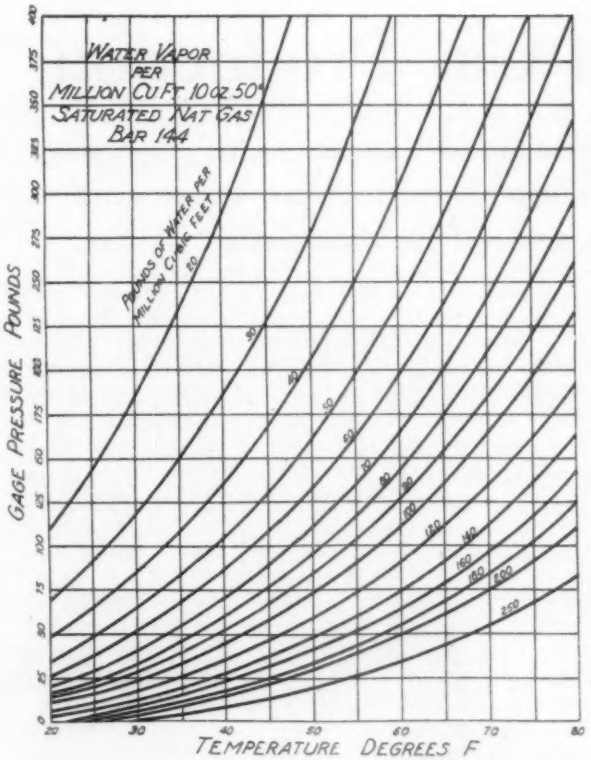

WATER VAPOR PER MILLION CU FT 10 OZ 50° SATURATED NAT GAS BAR 144
POUNDS OF WATER PER MILLION CUBIC FEET
GAGE PRESSURE POUNDS
TEMPERATURE DEGREES F

Figure 3

the temperature. Let us assume that the gas leaves the absorbers saturated at 250-lb. pressure, 80° F.; by reference either to Figs. 1 or 3 the water-vapor content is found to be 94 lbs. per million cu. ft. Select any point on the transmission system and measure the temperature of this gas. If the temperature as determined has decreased to 70° F., the pressure must have decreased to 179-lb. gauge or condensation will occur. In a similar manner, the pressure decrease which must accompany a fall in temperature to prevent the condensation of water vapor in the pipe line is determined to suit any given condition.

Effect of Line Pack

However, if, in order to care for the variations in demand on a gas transportation system, the storage capacity of the lines is to be used at all, it will not be found feasible to maintain a fixed pressure gradient between main line compressor stations, or between compressor stations and the markets. Line pack during off peak hours will, therefore, cause condensation—the other factors, temperature, and relative humidity, being favorable.

It follows that the designer of gas lines always has been faced with the problem as to the number and location of drips. The question "how many drips and where?" has confronted the natural gas engineer since the beginning of this industry. The installation of too few drips may cause serious difficulties, while to equip every low place in a line of any length would be prohibitive.

From the foregoing it is apparent that the lower the temperature and the higher the pressure of the gas as it leaves the well, the compressing station, or the gasoline plant, the less is its water carrying capacity; it follows, less will be the tendency for condensation to occur.

Many operators have found, for the above reasons, that by heavily dripping the sections of their pipe line systems nearest the field, and for the first few miles on the discharge of each compressor station, a practical solution of this problem is sometimes obtained. However, it is not an uncommon occurrence to find that water has accumulated in the least expected places.

How best to take the guess work out of the location and number of drips was a problem of no little consequence faced by the builders of the Chicago line. The length of this line is unusual. It extends from an area of moderate temperature into one of low temperature. The investment in this line was so great that no capacity could be sacrificed to inadequate dripping. The answer to their problem is the refrigeration plant in operation today at Fritch, Texas.

Use of Propane as Refrigerant

This dehydration plant (see Fig. 4) consists of equipment to lower the temperature of the gas on the outlet of Fritch gasoline plant to as low a temperature as it may reasonably be expected to reach on its journey to Chicago. At this reduced temperature separators remove the precipitated water and any mist that may be in suspension. The gas is then warmed in heat exchangers and sent "on its way."

Propane is the refrigerant—a supply of which is available at the nearby gasoline plant.

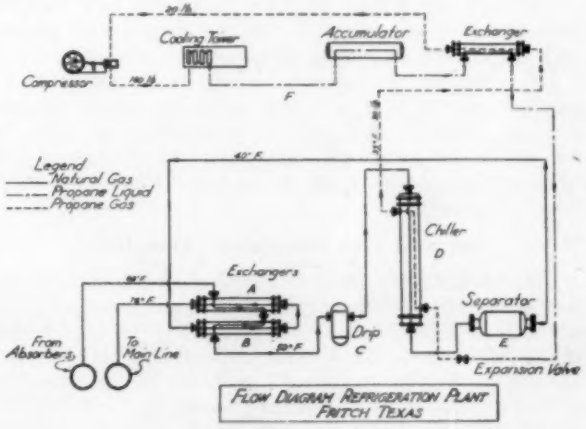


Figure 4

Referring to Fig. 4, the gas from the gasoline plant absorbers passes through heat exchanges A and B; thence through drip C. Any water that condenses in the exchanges is removed from the gas in drip C. Leaving drip C, the gas enters chiller D at the top, passing downward and out the bottom into separator E, where the suspended water in the form of mist is "knocked down." The gas is then returned through the exchangers to the main line.

The propane used in the chiller is recycled in equipment F.

As to the success of this installation, it may be said that the Chicago line, for one, is notoriously dry.

Concluded in July Issue

Control of Oil and Gas Production

Claude C. Brown, California State Railroad Commission, proposes appointment of single agency to control production, waste and utilization of natural gas and oil in California

THE natural gas that is produced in California is of two kinds, "dry gas," which comes from dry gas wells which produce only gas and no oil which can be and are shut in or throttled down as occasion requires, and "casing-head gas," which is produced in conjunction with oil from the wells at the same time that the oil is produced.

The quantity of dry gas produced is relatively small and occurs only during periods of heavy gas demand. On the other hand, the quantity of casing-head gas produced is large and occurs whenever oil is produced from high pressure wells. The quantity of casing-head gas produced depends upon the production of oil and more closely upon the "gas oil ratio" of the particular wells under operation.

The gas oil ratio, which is the number of thousands of cubic feet of gas produced per barrel of oil, can be controlled within certain limits by mechanical adjustments at the well, such as production through the oil string or through the casing, beaning down the flow, keeping back-pressure on the well, varying length and position and size of the oil string and by other means.

However, the position of the well on the structure has much to do with it and the depth to which the well penetrates the oil sand. In the cases of wells located on the top of the structure with short penetration into the oil sand, the attainment of a low gas oil ratio is difficult, if not impossible.

Oil and Gas Intimately Associated

Inasmuch as the greater portion of the natural gas produced in California is casing-head gas, produced with oil, and, further, that in the major fields, such as Kettleman Hills, little or no oil can be produced without substantial quantities of gas, the problem of the conservation of natural gas is intimately bound up with and connected with the production of oil from wells in fields of this type and the two cannot be divorced.

The quantity of natural gas produced depends upon the operations of the oil producers. The market for this natural gas depends largely upon the demands for gas upon the gas distributing utilities, and inasmuch as natural gas is now used very generally in California for the purposes of space heating, the demand for gas on the distributing utilities depends largely upon weather conditions.

In Southern California, the peak daily demand on a cold rainy day in the Winter time often reaches a figure that is from four to five times as large as the daily demand in the Summer time. The demand for industrial gas is not so dependent upon temperature and varies more with economic conditions.

Within the last few years, through voluntary curtailment of both oil and gas production, through the expansion of the quantity of gas used, the number of consumers using it, the area served and the additional uses found for it, and due to the vigorous administration of conservation legislation by the State, the amount of gas wasted has been very materially reduced. The following tabulation (total M. C. F. per year) sets forth the results of these influences:

	1929
Production (net)	557,634,000
Sales to utilities	119,727,000
Field use and other uses	189,430,000
Blown to air	248,477,000
	1930
Production (net)	544,765,000
Sales to utilities	141,385,000
Field use and other uses	182,388,000
Blown to air	220,992,000
	1931
Production (net)	385,201,000
Sales to utilities	168,965,000
Field use and other uses	147,758,000
Blown to air	68,478,000

From the above tabulation it will be noted that in the three-year period the production of gas has been reduced 31 per cent, the total utilization has been increased 2½ per cent, the sales to utilities increased 41 per cent and the wastage reduced 72 per cent. There was, during the month of March of this year, an average daily blow to the air of 45,000,000 cubic feet of gas as compared with 1,000,000 cubic feet in October, 1929, a reduction of 96 per cent.

The problem of the conservation of natural gas in California is not alone the problem of the oil industry. It is a problem which involves the oil industry as the producer, the gas utilities as the distributors, and the residents of California as the consumers.

The preservation and conservation of this valuable natural resource is vital to all three classes, to the oil industry for its propulsive force in raising the oil to the surface, to the distributing utilities in prolonging the useful life of the investment in pipe lines and equipment made for its distribution, and to the public in the economical and prolonged use of this high heating-content fuel at reasonable cost.

A Common Interest

All of these three classes have a definite and common interest in what is done to conserve both the gas and the oil resources of California. Wanton waste or uneconomical production of either or both of these commodities will detrimentally affect all. Reasonable conservation and economical production will inure to the benefit of all.

The quantity of oil and gas stored in the ground in California, although extensive, is limited. They are not resources that can be replaced as used. They cannot be "reforested" as in timber, for the reason that it took millions of years for nature to accumulate the deposits upon which we are now drawing and it would take mil-

lions of years more to again deposit what we withdraw.

Cooperative curtailment of production is difficult but not impossible. It is being effectively carried out at Kettleman Hills. Correlation of supply and demand of both oil and gas is difficult but not impossible. Control of the situation through legislative measures and through action of the courts is, of necessity, slow and limited to the area of jurisdiction of the court.

The problems involved are of a technical nature, including engineering and commercial phases, as well as legal questions. The element of time is involved for in the case of the correlation of the supply and demand of gas, while the fluctuations in the available supply are not sudden, the fluctuations in the demand may be, and often are, extremely wide and sudden, due to temperature and weather conditions.

The recent effort to initiate legislation creating an agency to control the production of oil in California having been defeated at the polls leaves the situation as before.

The oil producers, both large and small, are left to produce as they see fit, modified only by such curtailment agreements as they may voluntarily agree to, and to the restrictions in gas wastage imposed upon them by the State; little or no correlation exists between the production of natural gas and the demand for it and little or no correlation between the agencies of supply and demand.

The production and utilization of oil and natural gas are inseparable. If a minimum of natural gas wastage is to be attained, its production must vary seasonally. If the production of natural gas is to vary with the demand for it, the consequent production of oil must vary with it.

It is not feasible to store large quantities of natural gas. The cost is too high. Some can be stored both above and below ground, but the bulk of it must be used as produced. Oil can be and is now being stored in large quantities. There is an economic limit, however, in the storage of oil.

All of these factors tie in together and the problem at hand is their effective and economical correlation. The past attempts to handle them separately have not met with success.

Other industries have found it necessary to create agencies, consisting in some cases of a single individual, upon which is put the responsibility of creating and maintaining the control of their diversified problems.

Were similar action taken in this case, such agency or individual should be thoroughly famaliar with the problems of the oil industry and the public utility gas distributing companies, the regulations under which each operate, the problems of production, utilization and wastage of both gas and oil, and should have the ability and authority (granted by each industry) to correlate the supply and demand of these commodities with the minimum of waste and the maximum benefit to the owners that lease the land, the oil industry that produces the commodities, the gas utilities and others that distribute them, the public that consumes them and the State that taxes them.

Summary of Gas Company Statistics For March, 1932

REVENUES of manufactured and natural gas utilities aggregated $62,009,931 in March, 1932, as compared with $64,318,405 in March, 1931, a decline of 3.6 per cent, according to reports from 406 companies serving 14,039,322 customers and representing over 90 per cent of the public utility distribution of manufactured and natural gas.

This represents the smallest decline in revenues reported since May, 1931, and indicates a distinct improvement during the first three months of the current year. In January, 1932, revenues were 11.4 per cent below the preceding year, while in February the drop was only 5.7 per cent.

The manufactured gas companies reported revenues of $33,186,305 for March, a drop of 2 per cent from a year ago, while revenues of the natural gas concerns totaled $28,823,626, or approximately 5 per cent less than for March, 1931.

Sales of manufactured gas reported for March totaled 31,919,608,000 cubic feet, a decline of less than one per cent, while natural gas sales for the month were 64,577,188,000 cubic feet, a drop of 8 per cent.

A substantial part of the improvement in manufactured gas sales was due to the greatly augmented use of this product for househeating purposes. During March, 1932, sales of manufactured gas for this purpose aggregated 3,134,825,000 cubic feet which represents an increase of nearly 19 per cent over the corresponding month of the preceding year. This was in sharp contrast to the drop of nearly 4 per cent which characterized this class of business in February.

Throughout the country generally, industrial gas sales, both for manufactured and natural gas utilities, continued at levels considerably below the preceding year, the decline in sales of manufactured gas for industrial purposes approximating 9 per cent for the country at large, while industrial sales of natural gas were down nearly 9 per cent from March, 1931.

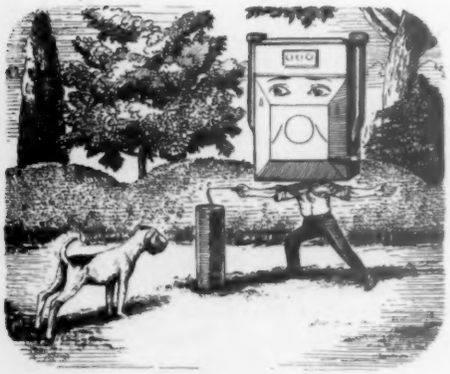
—Paul Ryan, Statistician, A.G.A.

Pacific Coast Gas Statistics

BELOW will be found a tabulation of gas company operations for the first quarter of 1932 compared with the same period in 1931, for the states of California, Arizona, Nevada, Oregon and Washington, and the province of British Columbia, as compiled by the Pacific Coast Gas Association.

	First Quarter		Percent Change
Production—Mcf			
	1931	1932	
Water Gas	836,423	872,448	
Coal Gas	389,070	413,209	
Oil Gas	2,413,575	2,481,778	
Coke Oven Gas	159,289	178,315	
Butane Gas—550 B.t.u.	7,796	90,017	
Natural Gas Purchased	44,800,806	40,790,315	
Total	48,606,959	44,826,082	—7.8%
Active Meters—March 31			
Domestic	1,553,275	1,557,417	
Industrial	67,650	69,893	
Total	1,620,925	1,627,310	+0.4%
Sales—Mcf			
Domestic	19,257,356	24,265,998	+26.0%
Industrial	20,609,005	15,635,954	—24.1%
Total	39,866,361	39,901,952	+.09%
Gross Revenue			
Domestic	17,864,549	21,479,826	+20.2%
Industrial	4,700,964	4,138,947	—12%
Total	22,565,513	25,618,773	+13.5%
Miles of Main March 31	24,306	25,327	+1021
Employes—March 31	12,503	11,212	—10.3%

AMERICAN GAS MERCHANDISING ALMANACK



1932

July

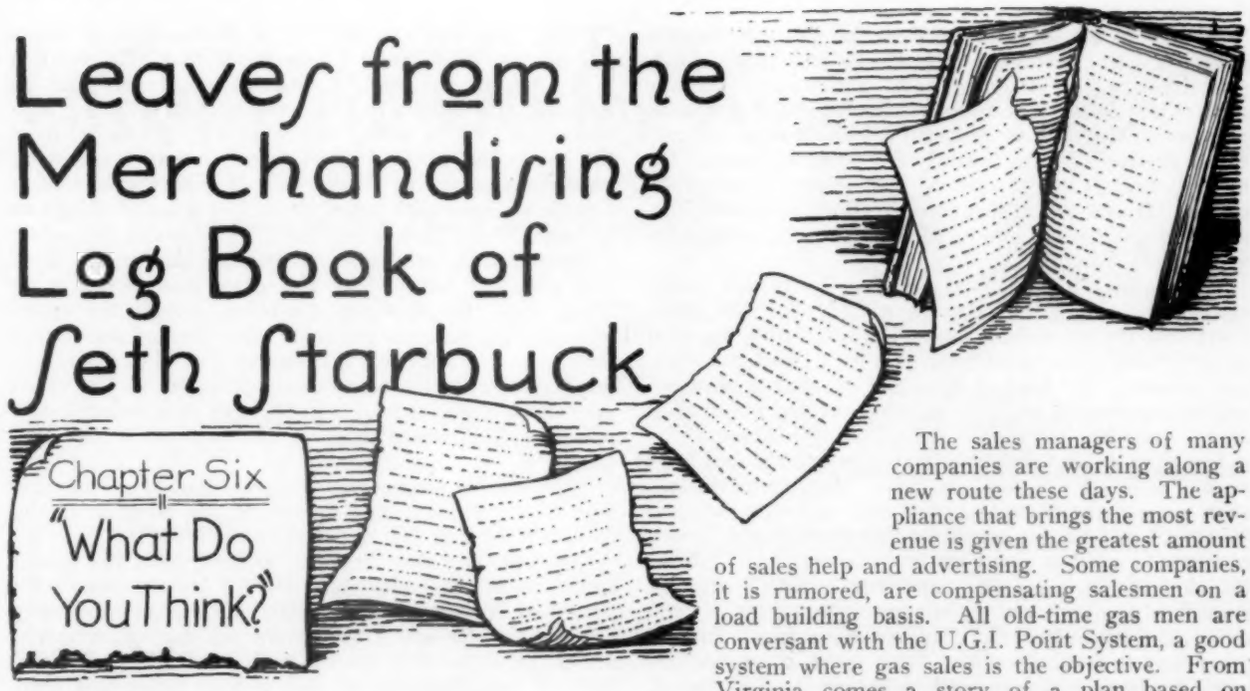
JULY brings the desire for cool kitchens. Heat controlled gas ranges and refrigerators have a great appeal when the salesman points out what they will do to make the management of the home more efficient, more pleasant. July brings Independence Day, the day that may be used to display any one of the many appliances sold by the gas men that have done so much to bring independence from "pot-watching" or "tea-kettle water heating" and many other tasks.

July affords the wide awake commercial organization a fine opportunity to demonstrate the value of the modern gas range in home canning. Canning contests, if properly conducted, will develop many prospective users of oven controlled gas ranges. July affords the gas man an ideal opportunity to sell incineration and "Swat-the-fly" may be turned into a selling slogan. Home laundry may also be played up. Gas press-ironers will be purchased by the thrifty home manager when presented properly. Sell her on the idea of saving, not only money paid to mechanical laundries, but money saved on clothes "done at home." Sell her the idea of having the maid do the flat work.

July calls for more frequent bathing; this means hot water service of the turn-the-spigot kind. Sell the home manager automatic hot water service. July brings the circus and the circus brings ideas for window display advertising with showmanship. Build window displays that symbolize, that carry showmanship. Window display advertising is coming into its own. Window display advertising is result getting and is the last step before selling. Use it for all it is worth, this last aid to selling at the point of sale. Trim your windows often and use as much thought in planning your displays as you formerly did in trying to "pep" up your salesmen.

1—Fri.	**Plan your window display advertisement to tie-in with the Day of Independence.** Battle of Gettysburg, 1863. Consolidated Gas Electric Light & Power Company of Baltimore reduces gas rates, 1910.
2—Sat.	President Garfield assassinated, 1881.
3—Sun.	Battle of Santiago, 1899.
4—Mon.	Independence Day.
5—Tues.	**Play-up refrigeration, automatic hot water service or carefree cookery in a daily newspaper advertisement.**
6—Wed.	Great flood in China, 1927.
7—Thur.	**Change your window display advertisement; why not a "Swat the fly window?"** A. Conan Doyle died, 1930.
8—Fri.	John D. Rockefeller born, 1839.
9—Sat.	**Check up activities and go over the activities of your men. Instruct them to sell "What it will do for you" in the matter of providing more freedom from household labor, in the way of thrifty savings.**
10—Sun.	F. P. Dunne (Mr. Dooley) born, 1867. In these uneasy times we need many like him to cause us to laugh now and then. Members of Safety Department of Henry L. Doherty & Company hold mid-year meeting in New York, 1917.
11—Mon.	**Talk turkey to the sales force; cut out inspirational talks and get down to cases—try to ascertain what the problem is and how to solve it.**
12—Tues.	Hull invaded Canada, 1812.
13—Wed.	Forest fires in Virginia, 1930.
14—Thur.	**Time to change your window display and store arrangement.** Sedition Law passed by congress, 1798.
15—Fri.	Americans drove Germans across Marne, 1918.
16—Sat.	**Another check up on month's activity. Lay out work for remainder of month.**
17—Sun.	Spanish army surrenders to U. S. 1898. President Cortelyou and Chief Engineer Bradley, Consolidated Gas Company of New York, officiate at meeting of the headings of the $5,000,000 Astoria tunnel, 1913.
18—Mon.	**Run newspaper advertisement, featuring cool kitchens.**
19—Tues.	Russian regiments mutinied, 1917.
20—Wed.	**Change window display; play up Automatic Hot Water Service.** Missouri Public Service Commission permits Kansas City Gas Company to increase rates from 80 to 85 cents per M. 1922.
21—Thur.	Chauncey Olcott, singer, born, 1860.
22—Fri.	Pilgrims leave for America, 1620.
23—Sat.	**Check up on sales and activities of men; instruct men of plans for advertising and promotion for balance of month.**
24—Sun.	Salt Lake City founded by Mormons, 1847.
25—Mon.	Lewis and Clark discover the three forks of the Missouri, 1805.
26—Tues.	W. J. Bryan died, 1925.
27—Wed.	**Run newspaper advertisement.**
28—Thur.	First official mail car put into service, 1863. Colonel Carter M. Braxton, prominent in formation of Newport News (Va.) Gas Company, dies at age of 62, 1898.
29—Fri.	14th Amendment proclaimed, 1863. Pittsfield (Mass.) Coal Gas Company reports "remarkably successful" year at its annual meeting, 1903.
30—Sat.	**Go over plans for August activity.** First U. S. patent issued, 1790.
31—Sun.	James Kent, Statesman, Born, 1763. **Run newspaper advertisement announcing August activity.**

Leaves from the Merchandising Log Book of Seth Starbuck



The sales managers of many companies are working along a new route these days. The appliance that brings the most revenue is given the greatest amount of sales help and advertising. Some companies, it is rumored, are compensating salesmen on a load building basis. All old-time gas men are conversant with the U.G.I. Point System, a good system where gas sales is the objective. From Virginia comes a story of a plan based on the law of averages that is proving profitable; from Illinois comes news of increased cash for men selling on straight commission, cash as a bonus on load building units; from Missouri comes a story about a department store employing a whole crew of former gas company salesmen and gas company methods to merchandise a well known line of nationally advertised gas ranges and water heaters—'tis said they will go after the heating business in the fall. Old ideas conceived by the gas man of yore are in full swing in new quarters.

These are trying times. However, improvement is in the offing. Many organizations are laying a mighty firm foundation for an upward swing that is bound to come. When improvement comes it will be nothing more than an old idea of merchandising in a modern dress. The economic upset of the past thirty months will help bring about improvements that will spell new profits and new and happy standards even in selling.

THE old order changes and turns out ideas in a dress. New habits and customers are created every day and superseded every night but old human nature, now that we've time to examine it, remains the same. The apartment dweller has a yen to hand to the lawn mower, to give his offspring a bit of green lawn. The home manager, previously hypnotized by hypothetical bargains in gas ranges and such, now visions tomorrow and loosens her purse strings when dollar value is apparent. Folks generally who fell for "gyp" merchandise offered on a price basis during the "buy now campaign" are gun-shy. Gas men during the coming months will find folks shopping and buying when sales talks turn to investment, dollar value and sound principles of design.

The expert in many lines finding himself without a regular pay day, has to create one and, in creating it, has gone about to use knowledge gained through years of experience with gigantic organizations to build an appliance or service with which there is a need. Necessity forced him to think out things. Limited capital caused him to check their uses.

As we emerge from these trying times we are going to find any number of new items to merchandise. We are going to be offered new ways of bringing new wares to folks who have a real need for them and know it, thanks to a new brand of sales promotion.

WE hear more about "what annual consumption we may expect per unit" and less about "good items to swell our gross income." It seems the gas man is really looking for new users of and new uses for the old B.t.u.

One man recently said, "the electric man puts up no fight when we sell washers, for the simple reason that they give him no load. We are just kidding ourselves when we think as soon as we sell a washer the woman who buys it will rush in and sign up for a water heater. It's just not being done." We are of the opinion that the thing to do is to sell press ironers to folks who have purchased washers from the hardware man, the specialty dealer or the electric shop.

STRESS develops desirable latent qualities and characteristics in man; it incubates new ideas and creates new incentives. Sophistication slumps, the blasé and inefficient are weeded out. Earning, not yearning will bring to the younger generation things they will use and enjoy. These changes will come about when the dog-eat-dog doctrine is dead and man's sole object ceases to be to keep up with the Joneses.

There is a market for gas appliances today and gas men who have the determination to get the business are getting it. The house organ of a holding company tells of a range round-up that is smashing records, and the company coverage is almost nation wide; a refrigerator dealer sets a new high mark; an automatic water heater sales breaks a previous banner record.

Sales are made in a new market. The press-ironer is sold to the woman who formerly sent her clothes to the steam laundry. Many a woman who bragged about her bridge clubs now talks of the delight she has in her home bakery; her new range is a joy. It's a fad (for economic reasons) to practice frugality in many quarters.

NOW of all times is the time for gas merchandise men to take down their books and study them; the time to lay down a solid foundation for the days to come; the time to make careful surveys of sales per meter; the time to make an intensive study of customer needs; the time to study the potential market for heating devices in commercial and industrial establishments. It is time to bend every effort to install line, ring and jet burners and to plan to keep that industrial gas load on your lines.

Commercial heating and cooking loads are being studied by the manufacturers of burners for other fuels; the electric industry is in the midst of a big educational advertising activity at this very moment,—they are watching this load, just as the internal combustion engine manufacturers are watching the industrial concerns, while keeping a weather eye on "the corner."

Speed in selling is passé. Study-methods and surveys of markets will be the vogue. Manufacturers will soon sense these facts and trim their sails accordingly. "Funny," said the representative of a nationally known concern, "I used to get a lot of business out of Blinkville but in the last four years they haven't given me enough to pay for visiting the town. You know it used to be I'd spend a half day there on every trip. Just no other way to make it. Now I can make it, get to Cartervill, Athens, Hillsburg and back into Washington all in one day. Hard roads and modern motors have made it possible."

THE commercial manager at Blinkville said to us a few days later: "You know that fellow Allen is a pain in the neck to me. I don't see how he gets by. He'll blow in here with a 'How's things, anything new? I'll be seeing you soon, I've got to get over to Carterville,' about once or twice a month—and what good does he do us, I ask you? I wish they'd send a man down here with some ideas, I've a lot of things to do and a lot of lines to sell and I'll say to you that when a representative comes along that has time to sit down and give me some ideas I'm darn glad to see him. These guys that do make our town, though, are either in such a big hurry to get some place else, or something, that I do not see why the houses that they represent don't just get out a nice catalog and give us the salesman's salary and expenses in the way of a reduced cost price on their wares that we can pass on to the customer."

That is a big story—what do you think of it? Is this man's experience a new one or is this another of the inefficiencies that the depression will cure?

One old idea that used to produce sales per meter and boost the gas sales per customer doesn't seem to be very popular these days; that's the circulating water heater sale. It seems that plumbers and chain stores are doing their share of the tank heater business. If the gas man honestly desires a load from this item would not a little activity help the thing and help the plumber and chain store sales as well?

Starbuck's Rebus—Answer on page 50

Wanted—Sustained Public Confidence

WE hear a great deal of talk these days about the decline in "public confidence." In the economic sense, it means that unsettled business conditions have caused people to become afraid to spend their money. They put off buying the things they need because they want the security that cash in the bank gives them against the future.

But there is another and equally important reason for the decline in public confidence. *Quality* in many products too has declined. *And the public has found it out.* In the landslide of prices which took place some time ago many retailers desperately tried to maintain "prosperity" profit margins by offering merchandise in which quality had been reduced in greater proportion than had the price.

Nor are retailers solely to blame. Many manufacturers, too, were guilty of this same practice. Manufacturers' organizations, like those of retailers, were geared to prosperity volume levels. The depression would last less than a year, or at best, no longer than 18 months, the experts said. And in the meantime, *let the public pay,* too many organizations reasoned.

There followed a period of ballyhoo about lower prices and greater values, most of which (let us be frank) were *not* greater values.

Business recovery has not come in 18 months. And the public has become wise. The masks have been lifted and the masquerade party is over. The decline in public confidence now applies to thousands of products, manufacturers and stores whose names were once a guarantee of quality and value but which now are regarded with suspicion by skeptical customers.

More than ever today, the retail merchant needs the confidence-building power of *national advertising* behind the products he sells.—*Thomas Rath in Magic Chef.*

Promotion of Gas

(*Continued from page 21*)

er through a single great industry association. The A.G.A. has before it an opportunity for service and for achieving of coordinated effort unequalled in the history of the industry.

NOTE:—Mr. McBride proposes in our next issue to discuss how modern promotion programs are organized in order to take advantage of every type of facility, including advertising, editorial publicity, house organs, association and committee cooperation, educational institution work, and other types. Such programs are now recognized problems of general management and engineering quite as much as of sales management.—Editor.

Effective Advertising Appeals

Analyzed by The Copy Writer

No. 1.

IT was at a recent local meeting of architects that a gas company representative decided to settle an argument. For several weeks he and one of the higher executives of the company had been discussing the extent of popular misconception regarding the cost of heating with gas. The company had a special heating rate, which had been fairly well advertised. In many cases the cost of heating with gas was little if any more than with other fuels. Yet the public was slow in taking advantage of the situation.

Mr. A. thought that the public had an exaggerated idea of what it cost to heat a home with gas. Mr. B., his superior, said that he didn't think this misconception was very widespread, especially among people such as home owners, etc., who were really interested in the subject. Mr. A., therefore, decided to grasp his opportunity by putting it up to the architects. There was a vote, the composite average of which was approximately as follows:

"Gas costs from four to five times as much as the next highest fuel."

Laying The Bugaboo

Many of us who try to keep close to the trend of public opinion are coming to the conclusion that house heating advertising of the immediate future should be directed largely at this price bugaboo. Even in communities where gas heating is actually a luxury, the public's estimate is apt to be considerably higher than the true figures, so that it affects the judgment even of those who can afford and are willing to pay for the added convenience of gas. On the other hand the public generally is more thoroughly sold than we realize concerning the cleanliness, comfort, and automatic convenience of gas for heating purposes.

Nine times out of ten, we are willing to guess, cost is the only factor that prevents the consummation of a sale. In a majority of cases, as we have said, the uninformed estimate of that cost is unnecessarily high.

It is interesting to note how many gas companies are developing this theme. There have been several ingenious methods of approach.

One way is not to speak of totals at all, concentrating only on *added* convenience or surplus leisure which can be obtained for a few cents a day. Thus the Washington Gas Light Company says:

"All for 75c a week—that is the only added cost of automatic gas heating for the average Washington home. For about 75c a week more than your present troublesome method of heating, you can have all these and many more joys that gas alone can give you."

The Consolidated Gas Company speaks of "EXTRA COMFORT" and advises the public to "Know how little it costs to heat your home with gas." In another advertisement, it pictures the prospect asking, "Will 10 cents a day give me the ADDED COMFORT of effortless gas heat?"

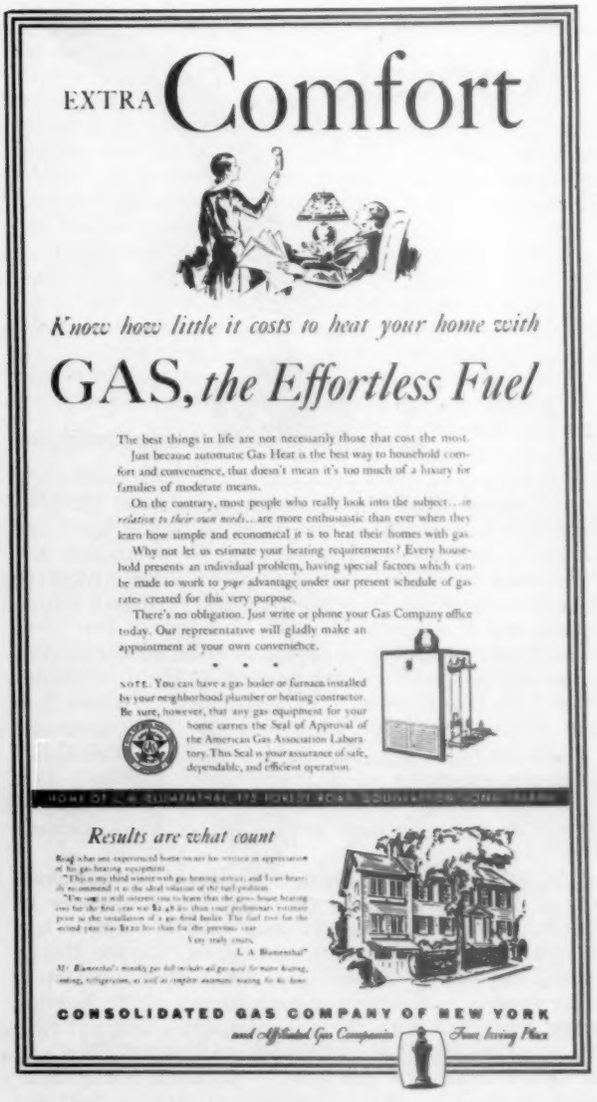
The direct statement or appeal is often very effective. "You Can Easily Afford Automatic Gas Heat"—"Here's Proof That Gas Heat is NOT Expensive"—"Have You Been Told That Gas Househeating Is Expensive? Well, It Isn't!"—"You Can Afford To Heat With Gas." These are examples of a fundamental approach that seldom misses fire when it can be followed up by demonstrable facts, such as actual bills of house heating customers.

This latter may be called the "legitimate testimonial" method, because it leaves no room for differences of opinion. This type of advertising calls for simple layout treatment. Just a headline, such as "Do you live in a house like one of these?" . . . a half-tone illustration of the house . . . figures for each month of the heating season compared with the gas company's original estimate . . . and finally the clinching statement "Then you can afford automatic gas heat." Sometimes one illustration is enough. Sometimes several are needed; for example, "Your neighbors are enjoying automatic GAS HEAT. Why don't you?" Or, "These——town Homes Are Heated with Gas"; and "We Heat These Homes—and 272 More—by Gas."

Fact Versus Rumor

The principal object is to get people to discover the truth for themselves by letting the gas company submit an estimate, based not on the experience of others, but on their own individual requirements. "What Will It Cost to Heat My Home with Gas?" Put that question into the minds of any given number and you will have just so many more prospects to work on. It is a constant battle between fact and rumor. "The grapevine telegraph," says one advertisement, "has been working overtime." To the home builder, the company advertises, "Don't decide on your heating equipment without first getting the facts about GAS FOR HEATING."

Rate changes are always good news, provided they are on the downward side. People who have been accustomed to violent fluctuations in other fuel prices appreciate the stability of gas service, whose price is controlled by commission regulation—usually at the lowest rate consistent with fair return on the investment. Even though you may have a special low rate for house heat-


EXTRA Comfort
Know how little it costs to heat your home with
GAS, the Effortless Fuel
The best things in life are not necessarily those that cost the most.
Just because automatic Gas Heat is the best way to household comfort and convenience, that doesn't mean it's too much of a luxury for families of moderate means.
On the contrary, most people who really look into the subject... in relation to their own needs... are more enthusiastic than ever when they learn how simple and economical it is to heat their homes with gas.
Why not let us estimate your heating requirements? Every household presents an individual problem, having special factors which can be made to work to your advantage under our present schedule of gas rates created for this very purpose.
There's no obligation. Just write or phone your Gas Company office today. Our representative will gladly make an appointment at your own convenience.
NOTE. You can have a gas boiler or furnace installed by your neighborhood plumber or heating contractor. Be sure, however, that any gas equipment for your home carries the Seal of Approval of the American Gas Association Laboratory. This Seal is your assurance of safe, dependable, and efficient operation.
Results are what count
CONSOLIDATED GAS COMPANY OF NEW YORK
and Affiliated Gas Companies
Your Living Plan

ing, you will be surprised how few of your customers, comparatively, have any idea of its existence except in the vaguest possible way. Some gas companies are satisfied with a mere announcement when the house heating rate is established. Others may follow this up by occasional reference to it in the advertising copy. Almost none, however, are capitalizing on the positive advantages which the special rate offers—fearful, perhaps, of the reaction from other customers who must continue to pay the higher domestic charge.

To the Copy Writer this attitude is about as absurd as if a suburban railway were to make a secret of its family ticket, commutation or excursion rate. The furthest that most gas companies seem willing to go in this direction at present is the type of general statement illustrated by "Gas House Heating Now at Lower Cost Than Ever Before," or "Gas Heat (for Heating) Is (Now) Cheaper."

A very few utilities have adopted the trial installation for promoting house heating as well as water heating. The approach, as used by one company, was made in the following manner: "It pays to be conservative about the heating of your home. You can try GAS heating and have all the facts in black and white before you begin." In another full page advertisement the direct offer was made, "A New Trial Offer for Gas House-heating . . . Use it for an entire season in your own home."

The logical appeal is, perhaps, the best for an extensive campaign, because it continues to present the same thought in a variety of ways. "Hundreds of Families Find Gas Heating Is Not Expensive" . . . eliminates the hesitancy associated with any form of pioneering and answers the unspoken caution to "be not the first by whom the new is tried." At the same time, none of us wants to be found in the rear guard of progress, so we react favorably to the reminder, "Once it was 'too expensive' to cook with gas!" And we rise or fall in our own estimation when we are made to realize that "Anyone who puts up with old-fashioned heating is working as a day laborer for ten cents a day."

"Considering all its many advantages," we finally come to the conclusion that "gas is the *cheapest* fuel as well as the *best.*"

But why be afraid of admitting, if we must, that gas is somewhat more expensive than other fuels? Your Copy Writer prefers a typewriter to pushing a pencil, although the ribbon alone probably costs him more than an equivalent number of pencil leads. We particularly liked, therefore, a last year's advertisement of the Washington Gas Light Company (which we are impelled to mention again) that seemed to us to sum up this thought as tersely, emphatically, and pointedly as anything possibly could. The headline simply declared: "IF COST IS ALL THAT MATTERS . . . LET'S GO BACK TO HORSES!"

Brooklyn Union Gas Company Employs Novel Stunt to Advertise $10 Offer

TAGS bearing the information shown below printed on one side of business reply postcards, are being used in a systematic effort to inform customers of the special inducement being offered in connection with the automatic water heater sales campaign.

THIS TAG IS WORTH $10

Just write your name and address below and mail to us and we will allow you $10 for your old water heating equipment on a new automatic gas water heater. You can pay for it over a two-year period.

Name .....

Address .....

The tags are being attached by meter readers to all non-automatic water heating equipment now in use in one- and two-family houses in this company's territory. A customer who is interested in purchasing an automatic heater merely has to detach the tag, fill in his name and address, and drop the card in a mailbox. A salesman will call and furnish full informaion on all types of modern heaters.

Each tag is stamped with the name of the meter reader. If a sale results, he receives a $5 lead commission, provided no prospect card for the customer was in the New Business Department's files before the tag was received through the mail.

The first card to be returned was one which had been left by Meter Reader James J. Gerrity, of Citizens' Branch.

What's Ahead For Gas Refrigeration

R. F. CALLAWAY

Faraday Refrigerator Corporation, Dayton, Ohio

IF we analyze the history of automatic or mechanical household refrigeration, we will find that the three and one-half millions of refrigerators now reported as being in use have all been produced and sold in the last twenty years.

As late as 1925 when the name of a well known household refrigerator was mentioned it was not unusual to have someone ask, what is it—A cold cure, or a corn plaster, or something equally ridiculous. Therefore, we are not exaggerating if we state it has taken almost the entire period of the refrigeration industry to date to educate the public to household refrigeration.

The Movement or Yearly Sales of Refrigerators

If we analyze the figure of three and one-half million refrigerators we will find it required ten years to move the first 10,000 units and furthermore approximately one-half of the total three and one-half millions were moved or sold in the last two years. Why this large percentage in the last few years? Many reasons may be given but the following are outstanding:

1. The public has become educated to the need for household refrigeration
2. This education has led to a general acceptance of household refrigeration
3. More dependable and attractive units were produced
4. Improved design and production facilities permitting progressive manufacture
5. General business conditions were such that many people could see their way clear to purchase an article which they believed they needed and certainly desired to further increase the everyday comfort of life.

Price History of Household Refrigerators

As late as ten years ago the average unit value of a household refrigerator was approximately $550.00 while last year this unit value had decreased to approximately $245.00. This decrease in unit value has been due to many factors. Increased knowledge of conditions to be met, better design, improved manufacturing processes, cost of material and quantity production have all played extremely important parts. Again the public played an important part, for they were trying to answer the question in their own minds of—What is the value of refrigeration service in the home—What should I pay for a refrigerator? Many other factors could be mentioned, but we believe the above will suffice for our purpose.

Portion of a paper read before Twenty-Fourth Annual Convention, Southern Gas Assn., New Orleans, La., May 3-5, 1932.

Distribution Problems of Refrigeration Industry

Papers by the armload could be prepared about this subject alone without exhausting the supply of material with which to work. Plans have been made, organizations built only to be changed again and again to meet the needs and conditions of the times in which they were used. With conditions ever changing this will no doubt continue to be true as long as merchandise is sold. Through it all however, there are apparent the fundamental truths that, The laborer is worthy of his hire and, The cost of distribution must be established in proper relation to the selling price of the product.

Having made these few very brief observations from the history of the industry to date let us approach some of the items which are without doubt ahead for gas refrigeration.

Education

While the public has generally accepted the idea of household refrigeration, it has not learned to discriminate between electric and gas refrigerators. The public generally does not know of the satisfaction which can be secured through the use of a good gas refrigerator nor has the use of gas for this purpose been popularized. The task of educating the public to this fact is not of the same magnitude as that of educating them regarding the use of refrigeration, but surely it is one of real proportion and not to be minimized by the members of the gas industry or the manufacturers of such appliances. Neither is this task one which can be accomplished by the executives of the gas industry working with the manufacturers but rather it is one which must enlist the aid of every person connected with the industry. This is not a reflection on the loyalty of any person connected with the industry, but a plea for the unanimous support of every individual and the establishment of a new sense of loyalty and jealousy, if you please, for the advancement and reputation of the gas business. We wonder how many can look about them in their own homes and feel satisfied they are, by example, teaching their many friends and acquaintances the comforts and conveniences of gas.

Sales of Gas Refrigerators

In the observations earlier in this paper, no reference was made to the part the gas refrigerator has played in the refrigeration industry. During the past five years the gas industry has had but one manufacturer of gas refrigerators and the gas industry and this manufacturer are to be complimented on the consistent increase in annual sales of this product. These five years have established the existence of a field for gas refrigerators. This year a new manufacturer, General

Motors Corporation, is entering this field through the Faraday Refrigerator Corporation. This corporation in keeping with General Motors' policy is introducing an absorption refrigerator which operates on a principle different from that ordinarily used in absorption refrigerators. The pioneering of this new type of gas refrigerator will advance the absorption principle of refrigeration and lend impetus to further development. This Corporation recognizes the field that exists, appreciates the work that must be done and is ready to accept its share of responsibility in the further development of the gas refrigeration field. The competition which the new refrigerator will offer will stimulate the gas refrigeration business as it will increase the line of products from which the prospective purchaser may choose, and thereby retain for the gas company a larger portion of the business which is now going to electric competitors.

The present period of sub-normal business conditions may have an effect on the sale of gas refrigerators, but this period can be used to excellent advantage in planning and building for the future.

Prices of Automatic Refrigerators

As indicated earlier in this paper the average unit value or price for each refrigerator has gradually declined until it would appear that at present there are indications that a general standard for price is in the making. In other words, the public has had an opportunity to more definitely reach a conclusion as to the amount of money it should expect to spend to get reliable and satisfactory household refrigeration. Of course there will continue to be offered to the public certain sub-standard merchandise which may have its appeal, but, if we may draw a comparison from the experience in the automobile field, we believe, the time is rapidly approaching when the prospective purchaser will realize fully that he cannot go below a certain fair price and expect to secure those features which should be included in the reliable and satisfactory household refrigerator.

As to the effect this price question may have on the absorption type of refrigerator we believe it can be established that the absorption refrigerator possesses inherent possibilities for quantity production which should enable it to hold its own satisfactorily from a price standpoint. Not only will future development have a decided effect upon this question, but the quantities distributed will play even a more important part. Therefore, the future of the gas refrigerator from this standpoint is an optimistic one.

Distribution Problems

Herein lie possibly the most important problems for the immediate future of gas refrigeration. Primarily the two interests most vitally concerned regarding this problem are the gas companies and the manufacturers of gas refrigerators. The problem of sale or distribution therefore will rest almost entirely in the hands of these two interests until other outlets are educated as to the possibilities of the gas refrigerator.

It is true that the gas consumption of the average household refrigerator is small and may be regarded by some gas companies as so small that they do not feel like putting forth the energy or expenditures necessary to place the appliance on their lines. While opinion is divided on this subject, we cannot deny, that the gas refrigerator furnishes a thrifty form of refrigeration service and one which is of great interest to the public at this time, due to the general conditions through which we are passing. To maintain its reputation for serving its customers in the best possible manner, the gas company cannot afford to ignore the fact that with this more economical form of service available it is their duty to present the possibilities of gas refrigeration to its customers.

It is not necessary that distribution of gas refrigerators be figured only on the basis of getting the appliance in the customer's home, for it is an established fact that the product itself represents a value equal to and in fact superior to many other forms of appliances designed for the same service.

We do not believe it is necessary for the gas company to absorb costs which form a legitimate part of the cost of distribution of such an appliance. It may be desirable in some instances to make concessions. However, we believe much work must be done in the immediate future by the gas companies in planning and putting in operation a method of distribution through retail selling organizations and dealers which will enable them to legitimately "earn their hire" and which will promote a better feeling toward the gas company and help to remove the antagonism so commonly found against the policy of merchandising by utilities. We do not believe there is any standard form of plan which can be applied generally throughout the country but we do believe that with careful planning, the proper kind of education and the use of considerable patience, a plan may be worked out in most any community which will ultimately prove satisfactory.

Should Study Future Problems

Judging from the foregoing remarks, you men may feel that this is a direct attempt to tell you in a nice way that there is nothing ahead but a lot of hard work. This is not the case, but we believe we should consider carefully and look clearly at a few of the problems which we know are ahead for gas refrigeration.

The developments which are ahead for gas refrigeration depend to a certain extent on the demand for the gas refrigerating equipment which is not available. Present indications are that future developments of gas refrigeration will include satisfactory commercial equipment; also that the development of air conditioning equipment will open up additional demand for refrigerating equipment which can be handled more practically and more economically by gas than by any other form.

Little did we think a few years back that we would reach the time so quickly when railroad equipment would include air conditioned cars. However, we have seen much progress along this line in just the past two years. Whether gas equipment has any part to play in such an application to mobile equipment only the future developments will determine.

We do know that gas equipment is now finding quite a bit of recommendation for installation on boats, particularly the smaller types of pleasure craft. In these types of application there is a decided advantage for gas because the fuel can be taken aboard in bottled form and the necessity for providing means of producing or storing electrical energy is eliminated.

Discovery of New Compound Bids Fair to Open Up New Market for Gas

A NEW market for gas, with great possibilities for sales during off-peak months, has been opened up by the discovery of a new chemical compound which tests indicate will make air conditioning available to home owners generally.

The new compound is the result of 18 months of research conducted by the metallurgical laboratory of The Peoples Gas Light and Coke Company, under the direction of Robert G. Guthrie, chief metallurgist, and Dr. Oscar J. Wilbor, research chemist. It has been christened "lamisilite" by its discoverers, because of its laminated structure and siliceous nature.

Lamisilite, it was explained by Mr. Guthrie, has the property of removing moisture from the air much more rapidly and thoroughly than other compounds now available for this purpose. It can be produced at low cost, and a smaller amount of it, which will make possible a reduction in size of air conditioning installations, will do the same amount of work as much larger installations of the materials now in use.

"The old expression 'It's not the heat, it's the humidity' is founded on fact," said Mr. Guthrie in announcing the discovery. "The most successful and healthful air cooling and conditioning devices in use today are those which remove excess moisture from the air in addition to lowering the temperature. Warm, moist air, laden with dust and obnoxious odors, is drawn through a fine spray of water, where it is washed and cooled, and then passed over a bed of lamisilite, which delivers it cooled, dry, and odorless. The lamisilite is easily dried out, after it has absorbed moisture, with an automatically controlled gas flame."

"It will be possible, with a small air conditioning unit, designed to serve only one room in a house or apartment, to relieve and often cure sufferers from asthma and hay fever by insuring them a full night of restful sleep in an atmosphere free from dust and bacteria," Mr. Guthrie stated. "The cost will be about 2¼ cents per hour for operation of the unit, which can be cheaply manufactured as air conditioning becomes a necessity instead of a luxury."

Mr. Guthrie emphasized the fact that merely cooling the air is not productive of real comfort. "It has long been known that the human body, under proper conditions of humidity, is the best of all automatic refrigerators, as the pores in the skin rapidly evaporate moisture, thereby lowering the skin temperature and keeping us comfortable," he said. "We can be perfectly comfortable at high temperatures if the air is dry enough to permit the pores in the skin to evaporate moisture."

People generally feel better and have more energy during spring and fall than at any other time of the year because the atmosphere is then properly balanced as to temperature and humidity, according to Mr. Guthrie. If proper air conditions can be maintained the year 'round, he sees no reason why that "spring-time feeling" should not continue twelve months in the year.

"If air conditioning becomes the rule rather than the exception, as it undoubtedly will, it will be much more healthful for us to stay indoors than to go outside," Mr. Guthrie said. "Of course, atmospheric conditions in some of our cities such as Chicago are abnormal. Correction of the smoke evil, which is another thing we won't have to put up with for many years longer as less crude fuel is used, will have an excellent effect on public health."

"Another important feature of the discovery of lamisilite is that it makes very valuable certain types of large deposits of a very common ore, which until now have not been worth digging out of the ground," Mr. Guthrie added. "For obvious reasons we are not at liberty to divulge the name of this ore, but we believe that its discovery, which creates a new industry that eventually will employ a great many men and require the purchase and construction of equipment to operate it, is another step, however small, out of the depression."

Effective Program Being Carried Out by Oklahoma Natural Gas Corporation's Home Service Department

OKLAHOMA Natural Gas Corporation has improved its relationship with three groups of the public served in Oklahoma City through cooking classes under the direction of Miss Mildred Clark, home service director for the company. The first cooking class was for the Camp Fire Girls and Girl Reserves, held on Saturday mornings during the month of December. These classes were on Christmas candies and cookies. Such interest was manifested by the children, their parents and leaders of the girls' group, and the results so splendid, that the organizations have asked the company to provide a summer program for the children.

The second class was that for Negro maids, which began in April and met for six Wednesday afternoons. Assuming that the members of the class were experienced cooks who needed only to acquire some of the finer points to be more useful to their employers, Miss Clark gave instructions and demonstrations on such topics as oven meals, quick breads, variations of favorite meals, roasts and steaks, cakes, puddings and ices. At the same time she offered suggestions on the proper use and care of gas appliances, and economy in the consumption of gas. This class, through its effort to promote kitchen efficiency and economy, has brought the gas company to the favorable notice of wealthier homes where its efforts to be of utmost service might be unnoticed otherwise; and also has been received by the Negro families as a friendly overture on the part of the company.

For the five weeks starting May 12th Miss Clark has arranged a cooking class for the special benefit of this year's brides, although any housekeeper who desires to enter the class will be welcome. The instruction and demonstrations for this group will be more elementary, and in addition to lessons on the preparation of food, helpful hints will be given on menu planning, table service, household budgets and similar subjects.

These classes are held in the modernly equipped and spacious headquarters of the home service department in the Oklahoma Natural office.

Natural Gas Department of A. G. A. Holds Annual Convention

Gas men discuss ways and means for increasing load. Technical problems also receive consideration

SPECIAL CORRESPONDENT

SUBORDINATING technical matters largely to the business problems of the immediate present and the near future, gas men met in Tulsa, Oklahoma, May 9-11, in the annual convention of the Natural Gas Department of the American Gas Association. The sessions were held in the Mayo Hotel.

The question of new revenue sources led off as E. A. Olsen of Tulsa, president of the Oklahoma Natural Gas Corporation, rose to make the first address after the opening ceremonies had been cleared. His talk was on the problems of the gas industry, but, he emphasized, "our chief problem right now is to sell gas." He mentioned the results of a campaign waged by the Oklahoma Natural Gas Corporation to illustrate that increased markets, even in the present business crisis, are possible through gleaning for the undeveloped business that lush time passes over.

Excellent Selling Results

"Results recently attained by the Oklahoma Natural Gas Corporation," said Olsen, "are illuminating. Industrial loads and commercial installations secured through diligent application during the period July 1, 1931 to April 30, 1932, produced additional annual revenues in excess of $700,000.

"In the development of the residence load, every employee is a potential salesman. That employees are willing and anxious to aid in such a movement, is shown by the excellent results recorded at the end of a thirty day campaign in February on our property here in Oklahoma. Four hundred and twenty-five pieces of equipment were sold through their efforts. Increased revenues from the sale of gas, which these appliances will consume, is estimated to be $185,000 annually. In addition, prospects representing annual revenues of $186,000 were unearthed and many of these have since become purchasers."

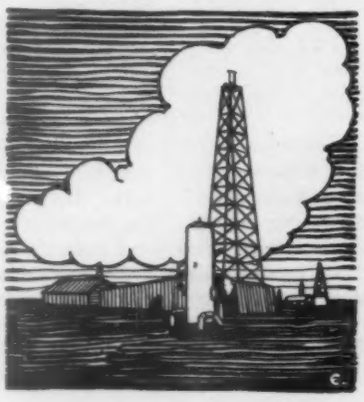
It was the connection between appliance merchandising, now forbidden utilities in Oklahoma, and the extension of revenue sources and the development of new business that led largely to the criticism of the legislation which splits a natural team of revenue producers.

J. F. Owens, of Oklahoma City, president of the Oklahoma Gas and Electric Company, another company which has fallen under the merchandising ban, dealt with the problem from a constructive point of view, namely: that of dealer cooperations. In analyzing the situation, he said: "The independent retailer is nervous about chain store aggression . . . He is the willing prey to the advances of the agitator, the racketeer and the self-seeking politician who counsel a resort to what should be the last resort of business of any character for the solution of its ills—legislation.

"On our part, there should be a recognition of the fact that the retailer has played, and should continue to play, a very important part in the economic life of the nation . . . We should recognize that we desire and need his assistance in doing the job that has been delegated to us.

"In too many cases we have failed to give recognition to these facts. In too many cases we have gone blithely on our way, merchandising appliances without giving thought to whether or not our methods of merchandising principles were correct. . . . After all, there is no justification for utility merchandising, except as it is necessary to bring to the attention of its customers the uses they may make of our services in their own interest.

"In every locality, each executive should call together the heads of every business having to do with the retailing of appliances; should welcome the cooperation of these retailers; should suggest the need of coming to an understanding on merchandising principles; should offer the company facilities in the training of salesmen in acquainting individuals with rates, cost of service and all other factors which, to the utilities are elemental but to the retailers are unknown."



Largely the same idea was expressed by LeRoy M. Edwards of the Southern Counties Gas Company of Los Angeles, Cal., in a discussion of "Dealer Cooperation, the Need and Justification for Utility Selling." Pointing out that selling of appliances is a necessary adjunct to the development of new business, Mr. Edwards spoke of the constricting legislation:

"There is probably no question before the gas and electric industry today that is more vital or of greater interest than the question of how best to meet the drive that is being made to legislate the utilities out of the appliance merchandising field. We had to face it before the legislatures of fourteen states last year. The movement succeeded only in Oklahoma and Kansas. Anti-merchandising bills were proposed and defeated in Massachusetts in March of this year. We are bound to be confronted with the same issue again in the legislatures of next year, unless we adjust the differences that now exist between us and the independent merchants."

Loebell Outlines Needs

Henry O. Loebell, of the Combustion Utilities Corporation of New York, stressed the need for research in the business if it is to continue. He pointed out that electricity, butane and other forms of energy are developing processes and appliances that really are inferior to those which employ gas.

"The gas industry," said Mr. Loebell, "must have new appliances, superior appliances, to meet the increasing competition. And it must provide the incentive for development.

"Specific development by designated companies can be subsidized by direct contributions.

"It is likewise possible to induce competitive development and provide the incentive by paying the originator of new equipment a royalty on all such appliances installed, regardless of who manufactured them or regardless of the legal patent rights of the individual parties.

"A third method consists of rewarding those manufacturers who contribute new ideas and developments through continuous purchases of the various appliances they offer, and thus, by giving them volume, provide them with the

money essential for maintenance of a continuous research department. This plan is most nearly ideal. The important thing is to settle upon a sound plan."

Early on the program came the address of the chairman, T. J. Strickler, covering generally and briefly the topics discussed more fully by later speakers.

Briefly reviewing the history of the natural gas industry, Mr. Strickler pointed to the sudden and enormous increase in taxation.

"From the period of 1919 to 1921, at which time we were bearing the burden of the war, our taxes increased from 10.9 per cent to 15.9 per cent of our national income. In 1923, this figure decreased to 9.1 per cent and at no time during the period of 1923 to 1929 were our taxes more than 11.5 per cent of our national income.

"In 1929, this figure jumped to 14.4 per cent and we are told that a conservative estimate of our total taxation will substantially exceed 20 per cent of our national income this year. This tremendous increase in taxation is in the face of a loss of many millions of dollars of national income.

"When the national, state and local governments absorb one dollar out of every five dollars of national income, and taxation doubles in two years, it is time for every citizen and every organization holding any interest in the welfare and the future of our nation to make a vigorous protest."

E. B. Reeser, president of the Barnsdall Corporation and former president of the American Petroleum Institute sounded a note of real optimism and encouragement.

"The Natural Gas Industry has turned the corner," he said, "the total revenues

for February 1932 were only 7 per cent less than for the same month in 1931. In view of the generally mild weather of February of this year, this small decline should be regarded as gratifying."

Mr. Reeser suggested for stabilization of the industry:

"First: Be more conservative in the expansion of your facilities;

Second: Business men and intelligent voters should not stand by and permit professional politicians to dominate local affairs;

Third: Natural gas companies should regard the modern idea of definitely adopting a policy of conservation, as has the petroleum industry;

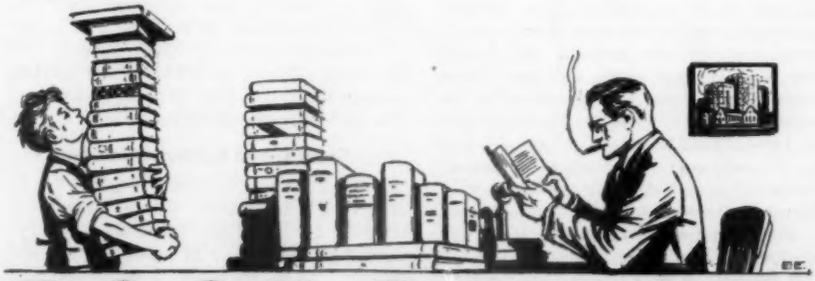
Fourth: It will be admitted that certain phases of our national activities would have been more constructive if it had not been for the Sherman anti-trust laws . . . The laws have been construed on the assumption that free and unrestrained competition will create a fair price to all. As a matter of fact free competition has forced prices below the cost of production and is rapidly eliminating competition via the bankruptcy route. The natural gas and petroleum industries are especially interested in the correction of these laws."

R. W. Gallagher, president of the American Gas Association, and Alexander Forward, managing director of the association, stressed the tax situation as did Chairman Strickler.

Others who spoke on matters of general interest included Walter Ferguson, vice-president of the Exchange National Bank of Tulsa; A. E. Bettis of the Missouri Association of Public Utilities of Kansas City, Missouri.

Samuel Insull, Jr., of Chicago, on the program was unable to attend, as were some of those who had prepared technical papers.

With the election of officers held in autumn, little business was transacted by the convention beyond the discussions. Social features included a barbecue at Mohawk Park and a dance at the Mayo Hotel on the night of the first day of the convention, a bridge lunch at the Tulsa Club for the ladies on Tuesday, and a cabaret banquet and dance Tuesday night in the Crystal ballroom of the Mayo Hotel.



National Directory of Commodity Specifications

The Second, Revised, Edition of the National Directory of Commodity Specifications has recently been issued. This was prepared in cooperation with the Bureau of Foreign and Domestic Commerce of the U. S. Department of Commerce.

In it are listed by title, designating number, and sponsoring organization, standards and methods of test for all commodities regularly produced in this country. Each specification is also briefly summarized as to technical characteristics, scope, and special applications. These special features will aid the user of the DIRECTORY to select specifications suited to his particular needs, and will make it indispensable to all large buyers whether Federal, State, municipal, or other. Its issuance meets an obligation entered into by the Secretary of Commerce at the Conference of 1923, at which the State governments were officially represented and also other national purchasing interests.

The enumeration of standards and specifications covered in this publication is limited to those adopted by national, technical, and trade associations and those agencies which speak with the authority of the Federal Government as a whole.

The price of this Directory is $1.75 per copy in the United States and $2.10 in foreign countries. Orders should be sent with remittance to the Superintendent of Documents, Government Printing Office, Washington, D. C.

Uniform Classification of Accounts for Natural Gas Companies

The Uniform Classification of Accounts for Natural Gas Companies, prepared by a committee of the National Association of Railroad and Utilities Commissioners, and recommended by them for adoption by State Commissions, has been published by that Association in pamphlet form. Copies are available at $1.00 post paid from the American Gas Association, 420 Lexington Avenue, New York, or from James B. Walker, secretary, National Association of Railroad and Utilities Commissioners, 270 Madison Avenue, New York.

Southern Gas Association Holds Twenty-Fourth Annual Convention at New Orleans

Prominent gas men present papers treating of problems both local and nation-wide in scope

SPECIAL CORRESPONDENT

J. J. BRENNAN of the Memphis Power and Light Company, was elected new president of the Southern Gas Association at the closing session of the 24th annual meeting of the association at the Monteleone Hotel.

He succeeded E. N. Avegno of New Orleans Public Service Inc. Other officers elected were B. B. Ferguson of the Portsmouth Gas Company, Portsmouth, Virginia, first vice-president; E. S. Dickey of the Maryland Meter Works, Baltimore, second vice-president; and S. L. Drumm of New Orleans Public Service, Inc., secretary-treasurer.

Outgoing officers, other than president, were Mr. Brennan, who went up from the first vice-presidency; J. W. Gates of the Mobile Gas Company, second vice-president; and J. M. Stone of the Central States Power and Light Company, Birmingham, secretary-treasurer, who was appointed to fill the unexpired term of George F. Schlatter, who resigned December 5, 1931, to take a new position in the utility field.

Directors elected for a one-year term were: J. Alvin Johnson of Birmingham and C. E. Dougherty of Chattanooga; for a two-year term, W. L. Plummer of Atlanta, J. F. Orr of Houston, C. B. Gamble of Birmingham and C. M. Rogers of New Orleans.

Washington was selected as the 1933 convention city; the time to be spring; and the date to be picked by the executive committee.

Avegno Tells of Progress

The first day's general session opened with an address of welcome by Mayor T. Semmes Walmsley of New Orleans, addressing the more than one hundred and twenty-five who attended. The report of President Avegno followed.

He reported that the first two issues of the "Southern Gas Association Progress," were satisfactory; announced that a membership increase of 16 per cent had been recorded—the membership going up from two hundred and seventy-one to three hundred and twenty-five; said that increased cooperation with appliance dealers throughout the South was bringing results and reported a decided change in the attitude of the trade associations toward merchandising by the utilities.

J. J. Brennan

"Some of these organizations have gone on record as favoring the utilities merchandising and are now inviting representatives of the industry to attend their conventions and address their members," he said. "I personally attended several of these meetings and just recently addressed the members of the Louisiana - Mississippi Master Plumbers' association on the subject of 'Plumber-Dealer-Company-Cooperation' at their annual convention held at Mandeville, Louisiana, April 22-23.

"It is very encouraging to report that in contrast to what happened last year, when some of the delegates favored the adoption of a resolution prohibiting the utilities merchandising, they are now almost unanimously in favor of adopting any reasonable utility dealer cooperative merchandising plan."

Touching on business in the South, he said, "Our industry is standing up splendidly under the circumstances and we can look forward hopefully to its future."

Warning that sensible economy and curtailment must be practiced for the present and pointing out the danger of losing present business or retarding the getting of new business, he said, "We should plan a promotional and loan-building program, not only to hold our present business, but one that will assist in securing every available piece of new business."

Regarding merchandising, he stated: "As a general policy cannot be adopted to cover all the details of utility merchandising in all communities, I recommend that a committee be appointed in each state represented in the association; each state committee to be composed of representatives of the gas companies operating in said state; the members of each committee to work with representatives not only of the gas companies, but of the electric utilities in an effort to further better relations in their particular community and state."

This recommendation was unanimously approved by the delegates. Another recommendation—that printing of the proceedings in book form be eliminated as an economy measure, preferably by printing them in the association's journal—was voted down. In its stead a recommendation providing for the distribution by some means of the papers read at the sessions was approved. Chairman S. E. Linton of Chattanooga of the committee making this recommendation, pointed out that the papers were the best that have marked the conventions in recent years.

Kahn Urges Intensive Selling

The next speaker was President D. F. Kahn of the Estate Stove Company, Hamilton, Ohio. His topic was "Shooting Against Par In Gas Appliance Sales." "The very life of the industry," he stated, "in my opinion, depends upon selling better, more modern appliances. Cheap gas ranges selling at absurdly low prices are a serious menace to the gas cooking load."

The range campaign now being conducted by the industry, he went on, is a blessing in disguise. He urged a sustained, intensive campaign to sell gas ranges, pointing out that the selling of gas ranges has gotten off to a bad start anyhow and this must be overcome. He advocated more cooperation between dealers and utilities.

The concluding speaker of the initial session was Hall M. Henry, assistant to the vice-president of the Utility Management Corporation, New York, who

spoke on "Holding the Cooking Load."

Saying that the gas cooking load is the backbone of the gas industry, he described the three year campaign of the electric range people and mentioned instances of misinformation in their advertising. "This competition must be met," he said, and listed the following as the necessary steps: (1) A definite interest on the part of the executives of the gas companies and their support in placing in effect plans and policies best calculated to meet the competition; (2) A continuous all-year-round advertising of the advantages of gas for cooking, with special emphasis on its flexibility, speed, economy and reliability, plus what it does for the housewife when used in a modern range; (3) A well ordered sales program which sets up as its goal the early elimination of all obsolete ranges; (4) A properly equipped sales force must be maintained to contact all customers. Where competition is particularly keen, a special range division whose sole purpose is to sell gas ranges should be organized; (5) The proper training of the salesmen in the fundamentals of gas range selling and gas cookery should be carried out; (6) The employment of a competent home service department to carry on cooking classes, to follow up all range sales and by education of the gas companies personnel on gas cookery methods; (7) The creation of a dealer policy designed to build dealer profits in gas range sales, not from subsidy but through greater sales volume; (8) Wholehearted cooperation with the gas range manufacturers in carrying forward a united program. (9) The establishment of a competent installation and service department; (10) The sale of bottled gas to the territory immediately adjacent to the gas companies area should be actively pushed; (11) The establishment of rates with greater promotional features; (12) Survey your own competitive situation to get the true facts.

Field for Water Heaters

A grand ball, with New Orleans Public Service Inc., as hosts to the visitors, ended the day's activities. The opening speaker at the second general session was W. R. Putnam, commercial manager of the Electric Bond and Share Company, New York, who spoke on "How Utility Sales Affect Dealer Sales."

"There is a large field in the South for the sale of gas water heaters, for 30 to 50 per cent of Southern homes are still without them," he said. "While very few homes now use gas refrigeration, fewer still have gas air conditioning, and improvements in gas ranges are again providing better chances for enlarging this field."

He recommended thorough dealer-utility cooperation in each field with the utility taking the lead.

The utility benefits from combined gas appliance sales in its territory, he went on, and not from the initial sales in themselves. He urged the continued sale of gas appliances by utilities in order to keep the various communities posted on latest developments, but pointed out that as much of the field as possible ought to be left to dealers when they are able to cover it.

The next speaker was Major Alexander Forward, managing director of the American Gas Association, on "Business and Government."

Forward Speaks on Taxation

"There is nothing in history to substantiate the theory that any government can perform the functions of business management as well as they can be performed under the stimulus of individual and cooperative initiative and enterprise and the reward of successful endeavor," he stated.

Taking the case of one somewhat successful municipally owned utility, he said that it was handicapped at every turn by the city government, being unable to make needed rate changes without years of dickering and forced to delay changes made necessary in methods or plant by modern conditions.

He cited the growing activities of governments, gave figures to show enormous increases in taxation and declared that the people are largely at fault for not taking a more active part in the selection of their administrators. He urged the molding of public sentiment toward abolition of war and suggested that more able private citizens go into politics.

The concluding speaker at this session was L. C. DeLeon, president of the Louisiana-Mississippi Master Plumbers' Association and president of the L. C. DeLeon Company, New Orleans. He spoke on "Advantages of Dealer Cooperative Merchandising."

He described the cooperative plan now in effect between New Orleans master plumbers and New Orleans Public Service Inc. It was begun in 1930, when the utility began a cooperative advertising and sales campaign in which the make of water heater handled by each dealer taking part was stressed at intervals in the campaign.

"Increased sales have resulted," Mr. DeLeon said, adding that during the 1931 mid-summer water heater sales campaign, the average plumber installed more heaters in those few months than he formerly installed in a few years. While the profits on installations were larger and the rate of trade discount higher previous to the present plan, the greater volume of business secured has made his net aggregate profit larger on the whole.

Employee and Customer Relations

The first speaker on the concluding general session was A. J. Sarre, superintendent of the Industrial Relations Department of the New Orleans Public Service Inc. He spoke on "Employee-Customer Relation Training."

"Modeling its activities on the American Gas Association training plan," he said, "Public Service has devised a program for training employees in job instruction and general development training. The job instruction end is carried out for special groups at regular intervals. At the meetings the problems discussed and solutions reached are embodied in a manual which is distributed to employees later.

"Other phases of the program, all designed to increase the efficiency of each employee, go into every detail of the utilities operations, particularly where they impinge directly upon the customer," Mr. Sarre said.

Consideration of resolutions followed. A resolution commending the officers and committee chairmen in charge of the convention for the excellent showing they made was unanimously approved and a motion for a rising vote of thanks was carried without dissent.

Technical sessions were carried on throughout the three-day meeting by the commercial-industrial section and the technical section. Mr. Brennan was director of the former with Charles M. Rogers of New Orleans Public Service Inc., as chairman. Mr. Ferguson was director of the technical section with Harold L. Gaidry of New Orleans as chairman.

Additional Papers Read

Addresses before the commercial industrial section were:

"Promoting Central Plant Heating," by C. P. Balsam, of the Washington Gas Light Company, Washington, D. C.; "Automatic Controls for Power Boilers," by L. S. Reagan, of the Webster Engineering Company, Tulsa; "Securing House Heating Load," by J. F. Orr, United Gas System, Houston; "Selling Gas to Laundries," by Louis Hill Hungate, Jr., of the Memphis Power and Light Company; "Selling Gas Water Heating to Apartments," by W. A. Hudson, Birmingham Gas Company; "What's Ahead for Gas Refrigeration," by R. F. Calloway of the Faraday Refrigeration Corporation, Dayton, but delivered by H. H. Wampler of the same company in Mr. Calloway's absence.

"Burning Gas in Large Power Plants," by H. R. Pearson, Dallas Power and Light Company; "What Air Conditioning Will Mean to the Gas Industry," by Eugene D. Milener, American Gas Association, New York; and a "Symposium on Employee Sales Campaigns," by E. G. Peabody, Baton Rouge Electric Company, Baton Rouge, Louisiana.

"Relationship of Pipe Line to the Distributing Company," by P. McDonald Biddison, Dallas; "Burner Conversions," by C. L. Nairne, New Orleans Public Service Inc.; "Odorization of Natural Gas," by W. A. Dunkley, Memphis Power and Light Company; "Enriching with Butane and Installing Small Butane Plants," by W. R. Thomas, Philgas Company, Detroit; and "Developing Natural Gas Service for Small Towns," by W. O. Turner, Louisiana Power and Light Company, Algiers, Louisiana.

EQUIPMENT NEWS

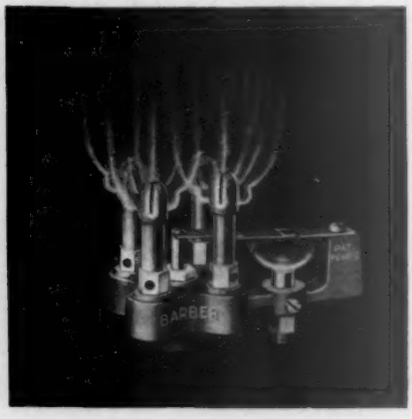
New Line of Barber Gas Burners

The Barber Gas Burner Co., Cleveland, Ohio, announce a new line of gas burners, which they designate as the "Barber Slotted Cap and Bell Baffle Burners with Safety Pilot Control."

The component working parts are machined to a fine degree of precision and accuracy, are interchangeable and made of metals especially selected for permanent performance—without necessity of repairs or replacements.

The bi-metal valve opening and closing element is equipped with a unique shield made of high temperature corrosion resisting Enduro metal which assures long life to the safety feature of the burner. The shield equalizes and maintains a correct operating temperature on the Thermo-Bi-Metal. It also protects the bi-metal from the direct flame of the pilot and avoids any ruinous effect should the gas contain sulphur or other impurities.

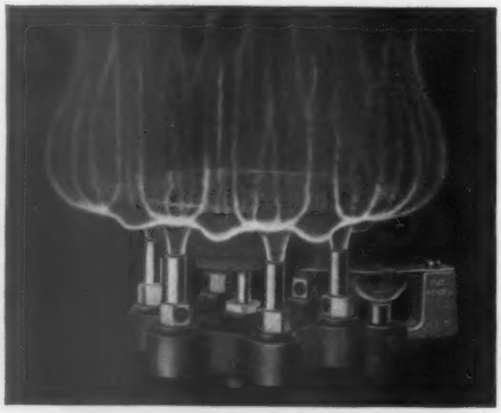
The Tobin Bronze Plunger Valve seats against the gas inlet seat in the main burner when the pilot flame goes out, thereby shutting off the gas supply to the burner; while when the main burner is on, the Plunger Valve seats against the Monel Metal Plunger Guide Cap—Thereby preventing gas leakage between the Plunger and Guide Cap. The Monel Metal and special Bronze material used in these two very important parts have been selected for their corrosion resistance properties and to provide perfect sliding surfaces between the Plunger and Cap to provide a safety feature should occasion ever demand. The design of this valve operation allows a movement between Plunger and Cap which will not stick by any gummy residue which may be contained in the gas, or from dust or dirt.



New Barber Four Burner

The shape and contour of the Bell Baffle has been developed by long and patient testing and research work. Its design and its location and support by the Barber Patented Jets presents a flame condition of fine distribution and regularity.

The new burners are noiseless, will not back-fire, require no servicing. There is no air mixer adjustment, and they develop 1900 degrees flame temperature. They are specially designed for water heaters, gas furnaces, boilers and numerous other domestic and industrial gas fired appliances. A bulletin containing information as to sizes and capacities for both manufactured and natural gas will be mailed on request.



New Barber Six Burner

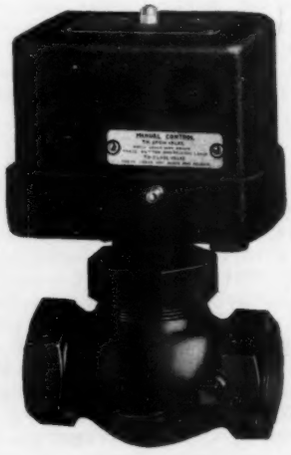
New Company Enters Gas Control Field

Automatic Products Co., Milwaukee, Wis., is the name of a new organization for the manufacture of gas control devices. R. W. Johnson, President, was formerly vice-president in charge of production of the Time-O-Stat Controls Company. A. E. Petersen, in charge of sales, was formerly in charge of sales of gas equipment for Time-O-Stat Controls Co. The company announces two gas control devices—Model 75 Motor Gas Valve and Model 80 Room Thermostat.

The Model 75 Gas Valve is opened by means of the small low voltage induction motor operating through a train of gears against a spring loaded valve, and kept open by means of a small magnetic brake, operating against a drum on the motor shaft.

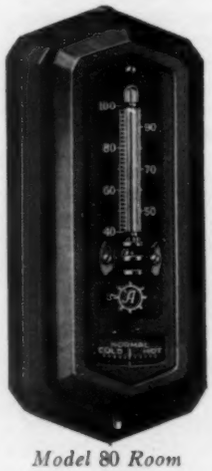
Installation is simplified by the use of a two wire circuit. The Model 80 Thermostat with its magnetic action is especially well adapted for use with this valve.

When the Room Thermostat calls for heat, the motor is energized and raises the valve to its open position against the spring. When the valve reaches its maximum open position, the motor circuit is broken, and the magnetic brake is energized, engaging the brake against the brake drum and holding the valve in the open position. When the circuit to the valve is broken by the Thermostat or Limit Control, the brake releases and permits the spring to return the valve to the closed position.



Model 75 Gas Valve

The Model 80 Room Thermostat is an exceptionally attractive instrument in a new and distinctively modern design. Finished in a rich bronze, it blends readily with the coloring and furnishing in most homes.



Model 80 Room Thermostat

The Model 80 has a base of moulded bakelite, to which all operating parts are permanently mounted. The cover is of drawn brass and is readily removed. After exhaustive tests, a special alloy has been adopted for all contact points. All metal parts are plated to protect them from corrosion. The use of a moulded base permits installation to be made against any type of wall without danger of distortion.

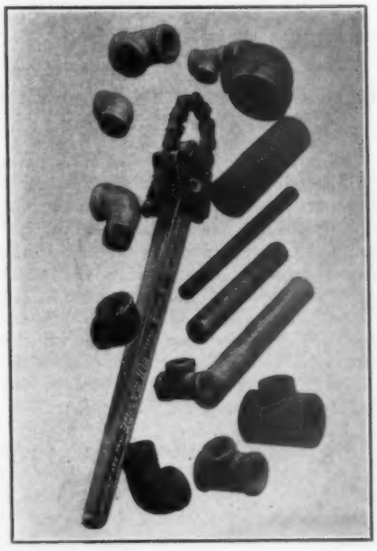
These Thermostats are factory-set to operate within a total variation of temperature of less than 2° F. When the indicator is set at "Normal," the Thermostat will control the temperature at from 69°-71°.

Descriptive bulletins will be mailed on request.

New Type of Chain Pipe Wrench

The American Industrial Corporation, 230 Park Avenue, New York City, is placing on the market a chain pipe wrench, called the FULRANGE, with very distinctive features.

The illustration is an attempt to portray the universal use that this wrench can be put to. The No. 1 size not only



efficiently handles pipe from ⅜" to 1½", but will also handle tees, elbows, and street fittings of every nature that fit the above pipe sizes.

The FULRANGE grips from the front and hence can be efficiently used in corners and where obstructions are found. It is reversible and can be operated in either direction without removing the pipe or adjusting the chain.

Blowpipe for any Grade of Natural Gas

The Torit Mfg. Co., St. Paul, Minn., recently issued a folder describing the "Torit Blowpipes," for soldering, light brazing, melting, wire splicing, core dry-

ing, and various other operations requiring heat. They are designed to use any grade of natural gas. They are light in weight, and have adjusting air and gas valves, which gives the operator either a small hot flame or a large soft one. Copy of folder will be mailed on request.

Appoint Chicago Representative

The Homestead Valve Manufacturing Co., Inc., Coraopolis, Pa., have just appointed the Lietz Engineering Co., 2354 Lincoln Avenue, as their exclusive representative in the Chicago district. Lietz Engineering Co. will handle the sale of all Homestead products.

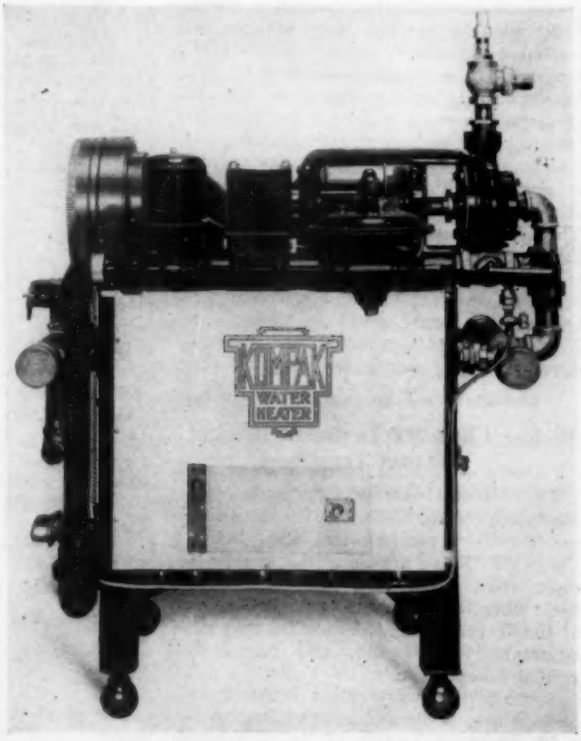
Large Volume Water Heating

The Kompak Company, New Brunswick, N. J., announce the "New Kompak" heavy duty water heater. H. J. Long, President of The Kompak Co., in commenting on the new water heater, stated:

"Gas Companies today are confronted with the same problems as other manufacturers, namely, to retain those customers whom they already have, and to secure new outlets.

The domestic consumption for gas is being constantly promoted by the majority of artificial Gas Companies and many natural Gas Companies, but in these times the reduced income of thousands of home owners has increased the difficulty in the sale of new appliances.

The last few years have shown a marked increase in winter house heating with no corresponding outlet for use of gas in the summer time. An unbalanced load is a source of increased operating expense, with the result that many Gas Companies have been turning to an entirely undeveloped field to secure a class of business which can bring splendid returns during the summer, namely, large volume water heating. Special promotional gas rates undoubtedly assist materially in securing this class of business, but even without the special low rates that some Companies already have, there is a very considerable amount of so called large volume water heating that can be secured in every community without the feature of an especially low rate.



The recognition of the growing demand for this size of gas service has prompted The Kompak Company to make exhaustive experiments during the last three years, to furnish the Gas Industry with an appliance especially suited for the heavy duty required in large volume water heating. One of the greatest difficulties encountered in the effort to secure this business has been the lack of a proper type heater to attach to existing equipment. For direct connection to a tank some form of rust resisting material which would stand water pressures must be used. Copper coils give a relatively short life under heavy duty, and the condensation which has always existed in high efficient heaters of this character has been ruinous to the heater itself. The use of cast iron sectional steel boilers with indirect water heating has been very satisfactory and widely used, but in many cases the cost and difficulty of installation make this type of equipment unsuitable.

The new Kompak which has just been announced throughout the trade press, offers so many advantages in simplicity of installation, high operating efficiency and durability of parts, that it opens an entirely new opportunity for the Gas Industry to solve the problem of heavy duty water heating. One of the prime difficulties in attaching a water heater to existing tanks, is the fact that in many cases the tanks are located too low or in a very congested place and usually with tappings not large enough for a direct connected gas water heater and an indirect heater. Moreover, proper ventilation has always been a big problem with all types of gas water heaters. The new Kompak does not depend upon gravity to circulate the water, but has an electric pump which circulates the water from the storage tank through the cast aluminum heating sections and back into the tank by forced circulation. This forced circulation not only greatly increases the heat transfer, giving a thermal efficiency of over 80%, but it allows a heater to be installed with only 1" circulators for 1,000 gallons an hour, where gravity circulation would require 2½ or 3" circulators for that capacity. Moreover, the location of the storage tank has no effect on the circulation so that the tank can be on the floor, or the heater even located in the room above,

or at a considerable distant point, and still circulate the water freely into the tank. Connected to the same motor that operates the circulating pump is a chrome fan in the flue mounted on ball bearings, which give an induced draft to the burners and makes it possible to ventilate the heater into any convenient opening and make the installation under any conditions. Due to the form of the heating sections, combined with the forced draft combustion, there is no condensation whatsoever in the heater at any time.

The aluminum sections are tested to 325 lbs. and guaranteed against corrosion with normal city water conditions.

The very high thermal efficiency combined with no standby, due to trapped circulation while heater is standing, increases the overall efficiency as much as 25% over the average large volume installation, so that it can be readily realized what a wonderful opportunity this heater affords for securing new business at attractive rates and also for installation to keep business already on the lines which might be switched away to oil or coal. The coal stokers are exceedingly active and oil is low in price. The Gas Industry must have the finest, most economical gas equipment that it is possible to build, in order to successfully retain the business already developed and secure new load. This New Kompak is the latest and most modern development in gas water heating."

Fisher Class ST Inverted Bucket Steam Trap

The Fisher Governor Company, Marshalltown, Iowa, have just issued Bulletin ST-10 covering the new Fisher Class ST Trap, which is the result of more than two years development in the Fisher Research Laboratories. Some of the features claimed for this trap are adjustable valve post, and positively guided inner valve.

Some of the construction features described are, body and cover of a semi-steel, inverted bucket of heavy gauge spun brass, lever and pins of stainless steel. Valve and orifice seat are of high quality heat-treated stainless steel. All parts are accessible and renewable while trap is connected in pipe line and no special arrangements are required to remove any of the parts.

The bulletin gives all of the capacity information in pounds of water handled for each size of trap on the various pressures, as well as all principal dimensions and price information. Copies will be mailed on request.

Catalog Issued on Cement and Compounds

Technical Products Co., Pittsburgh, Pa., have issued Insa-Lute Cement & Compounds Catalogue No. 32 to the trade, containing instructive information on industrial assembling, insulating, acid-proofing, etc. Copies can be obtained on request.

NEWS of the GAS INDUSTRY

Construction Program Planned by Montreal Light Heat & Power

With a construction programme planned for the 1932 season totalling approximately a million and a quarter dollars, Montreal Light Heat & Power Consolidated expresses in a definite manner its confidence in the economic stability and future prosperity of the City and District of Montreal.

Proposed extensions are to be effected in both the electric and gas departments of the utility company. These include additions to transmission, substation and distribution facilities amounting to about $850,000 in the Electrical Department and additions to gas mains and low pressure service pipes to the extent of about $400,000 in the Gas Department.

Gas Department construction will include the installation of about twenty miles of gas mains, six inches to sixteen inches in diameter, and the addition of about two thousand domestic service pipes. At the gas plants the construction is limited to the extension and improvement of the water intake and sewer outlet to the new wharf line at Hochelaga Storage and Compressor Station.

In accordance with the usual policy of the Company, all material and equipment used will be of Canadian manufacture, when of equivalent quality and price, with preference when possible to Montreal firms.

Addison B. Day Medal of Honor

Through the generosity of Mr. Addison B. Day, a Past President of the Association, the Pacific Coast Gas Association is privileged to make an annual award of the Addison B. Day Medal of Honor to the Association member who is deemed to have rendered the outstanding individual service in behalf of the gas industry.

The award may be made for distinguished accomplishment in research; invention; operating methods or practices which reduce the cost of production, transmission, or distribution, or which improve products or by-products; increasing the sale of gas, and outstanding sales development work, including advertising and publicity; development of new uses for gas; improved public or employee relations; promotion of safety; development of improved accounting practices; and new methods in manufacture, finance or rates.

Every member of the Pacific Coast Gas Association is entitled to make application for the Medal or to be nominated by his friends or the company employing him. Applications or nominations should be made to the Association prior to July 1 of each year. The judges will be the President and Vice-President of the Association and three members of the Association appointed by the President.

The presentation of the Medal will be made at the Annual Convention.

Annual Report of Oklahoma Gas & Electric Company

The annual report of Oklahoma Gas and Electric Company for the year ended December 31, 1931, shows gross earnings totaling $11,887,260, a decrease of 16.78 per cent, and net earnings including other income before appropriations for retirement (depreciation) reserves were $6,114,405, a decrease of 10.89 per cent. The balance available for amortization of debt discount and expense, common dividends and surplus was $1,735,200 for the year 1931 compared with $2,571,403 for 1930, a decrease of $836,203.

J. F. Owens, president of the company, in his letter to stockholders, pointed out that the company is in sound financial condition, that practically all of the reduction in earnings has resulted from reduced activities in the petroleum industry, and that economies effected in the company's operations have resulted in substantial savings.

Large Gas Well Brought in in Indiana

Levitt E. Gray, drilling superintendent for the Knox Engineering Corporation, has stated that the gas well brought in near Oakland City, Ind., is the largest ever brought in in Indiana. He estimated the present capacity to be 15,000,000 cubic feet daily. The roar of gas when struck at 1,500 feet was deafening. The well was capped in an hour and a half.

Convention Calendar

June

19-23 Annual convention Public Utilities Advertising Association, New York, N. Y.

27-29 Semi-annual meeting American Society of Heating and Ventilating Engineers, Hotel Pfister, Milwaukee, Wis.

August

24-26 Pacific Coast Gas Association, Hotel Del Monte, Del Monte, Calif.

October

4-5 Indiana Gas Association, French Lick Hotel, French Lick, Ind. P. A. McLeod, Sec'y.-Treas.

10-14 American Gas Association, Atlantic City, N. J.

Non-Utility Status Held For Gas Company

Distributing gas to neighborhood groups of customers without using the public streets leaves a company in non-utility status according to a decision of the Supreme Court of Ohio, which has confirmed the order of the Public Utilities Commission of that state. The company in question was the Paramount Gas Utilities Company which is merchandising gas to neighborhood groups from storage tank buried under the ground by means of pipe lines reaching customers in the immediate vicinity without use of the public highways. This company selects its own patrons, fixes its own rate schedule according to circumstances, and determines whatever form of contract may be necessary in each instance.

The company itself sought to be judged a public utility company in a case in which it asked the state Public Utilities Commission to approve the issuance of certain securities. The Commission ruled that such an operation did not fall within the scope of the Commission's authority and declined to pass on the security issue. The court appeal above referred to was the result. The decision apparently hinges essentially on the character of the operations of the enterprise rather than upon any technical definition of the word "public utility." The court is quoted in the following language, one of the most significant parts of the decision:

"However, it may also be true that important considerations exist which might very readily induce the gas company to have itself adjudged as a public utility. For instance, it might add very materially to the value, in the minds of investors, of the stocks and securities to be marketed by the gas company, to have it known that that company was clearly within the jurisdiction of the Commission, which must supervise and approve any securities placed upon the market.

"And it might also be recognized that this public utility in its operations could not be unjustly interfered with by competition, and that the matter of competition was one that would be regulated by the Commission.

"We think a protection against unreasonable and ruinous competition might be highly desirable for the gas company, and so desirable as to much more than counterbalance any possible restrictions upon the freedom of its action with regard to its securities or otherwise, which might arise by reason of its being adjudged such public utility.

"If any mercantile establishment, selling its goods to the public in general, could have its business adjudged as falling within the jurisdiction of the Commission, and thereby eliminate, or at least greatly diminish, competitors from unfairly coming into a determined field, evidently all distinction between mercantile operations, carried on by persons, partnerships, corporations, or associations, and public utilities, as now generally recognized by law, would promptly disappear, and the Commission would quite as promptly be completely swamped in any effort the Commission might make to take care of the situation thus arising, and general provisions of the public utilities law would become broadened far beyond anything that the Legislature ever had in mind in the enactment of the public utilities statutes."

Order Reduction in Gas Rates

Gas patrons in Logansport, Ind., have been given a reduction in their rates in an order issued by the Indiana public service commission. Petition for the reduction was filed by the city of Logansport, through city officials. Service is given by the Northern Indiana Public Service Company. The commission fixed a valuation of $434,000 on the property. The new rates will give a return of 7 per cent on that valuation. It provides for a minimum monthly charge of 75 cents. Rate for the first 2,500 cubic feet will be $1.35 a 1,000 cubic feet; for the next 2,500 feet, $1.25 per 1,000; for the next 2,500 feet, it will be $1.15 and for all over, $1 per 1,000.

Cities Service Company Announces Regular Dividends

Net to Common Stock and Reserves of Cities Service Company for the first four months of 1932 shows an increase over the similar period of last year.

During April, the use of electric current by domestic consumers of subsidiary companies showed a slight increase over April, 1931, and sales of coke from the subsidiaries' manufactured gas plants have increased.

Crude oil pipe line transportation facilities showed a slight increase in business during the month.

In the thirty days ended May 15, 1932, the number of holders of Cities Service Common Stock increased 3,618, bringing the total to 532,235.

Regular monthly dividend of 50c on the Preferred and Preference BB stocks, 5c on the Preference B stock, 2½c in cash and ½ of 1% in stock on the Common Stock were announced, all payable July 1st to stockholders of record June 15th.

Newspaper Puts on Cooking School

A cooking school was recently sponsored by the Standard Examiner, newspaper of Ogden, Utah, tying in with the merchants and manufacturers of the city. Miss Naomi Barlow, Home Service Director of the Utah Gas and Coke Company, Salt Lake City, was the demonstrator. One of the features of the school was a baking contest and an automatic Roper range was given as the grand prize. There were about 200 entries in the contest.

State Taxing Power is Sustained

The Supreme Court of the United States on May 16 declared constitutional the Idaho tax law on production of electric power. This law placed a tax on power generated in the state even though the power was used in interstate transmission. By analogy, one may infer that a state has the power to tax all gas generated or produced from natural gas wells within its borders regardless of the interstate character on handling or sale of the gas. The court very clearly defines the process of generation of electrical energy from a water fall as an intrastate operation. It can be reasoned, therefore, that the production of gas is equally an intrastate activity, regardless of the destination of the gas.

Observers in Washington infer from this decision that states may impose any tax that they desire on the production of gas within their borders even though this tax becomes applicable to a supply for interstate transmission or sale. In this respect, the decision is perhaps more clean cut and positive than any previous case bearing on the rights of states to tax utility operations, part of which are interstate in nature.

Gas to the Fore at Convention of Master Plumbers

An intensive effort to widen application of cooperative merchandising principles, agreed upon by organized Gas Companies and organized Master Plumbers a year ago in Milwaukee, will be made by the American Gas Association working with Greater New York Gas Companies during the Golden Anniversary Convention of the National Association of Master Plumbers to be held at Madison Square Garden in New York June 20th to 23rd inclusive.

In addition to the displays of a group of Gas Appliance Manufacturers who have successfully operated under the cooperative plan in Greater New York City, the American Gas Association and New York Gas Companies will maintain a large reception booth where leading members of Master Plumbers organizations from over the country will be consulted as to ways and means of applying cooperative principles in their respective home communities.

The reception booth, which will stress the importance of the scientific services of the American Gas Association's testing laboratories will be maintained by the following Companies in cooperation with the A. G. A.: Consolidated Gas Company of New York; Brooklyn Union Gas Company; Public Service Electric & Gas Company; Kings County Lighting Company; Brooklyn Borough Gas Company, and the New York & Richmond Gas Company. Gas Appliance manufacturers who will display their products at the Golden Anniversary Exposition,

which will be held in conjunction with the Convention, are as follows: The Electrolux Refrigerator Company; The American Stove Company; Faraday Refrigerator Company; Roberts & Manders Stove Company; Ruud Heater Company; Hotstream Heater Company; American Gas Products Company; The Kompak Heater Co., and in all probability, several other firms.

Maintenance of a reception and contact booth is, according to American Gas Association officials, only a part of the program for developing a wider application of cooperative merchandising principles. A special advertising program planned to direct attention of visiting Master Plumbers to the Contact Booth, is being launched for the month before the Convention meetings. Leading trade publications of the plumbing and heating industries will carry page advertisements directing the attention of the Association members to the Exhibit at the Exposition and asking them to bring local difficulties in the application of the cooperative plan to the attention of attendants at this booth.

Agreement upon cooperative merchandising principles was reached between the National Association of Master Plumbers and the American Gas Association after conferences between leaders of the two trade groups on March 2nd and on June 3rd, 1931. Mr. Hugh H. Cuthrell of the Brooklyn Union Gas Company, acting as representative of the A. G. A. described the principles at the Milwaukee Convention of the National Association of Master Plumbers. Subsequent to the Milwaukee Convention of the National Association of Master Plumbers cooperative merchandising principles have been successfully applied in a number of American Cities. Further application of these principles is anticipated for the coming year.

First Industrial Gas Engine Installed in Atlanta

A 120-horsepower Worthington vertical four-cylinder gas engine for belt driving the large compressor in the 35-ton ice plant of the Lunsford-Wilson Ice Company on Stewart avenue has just been installed by the Atlanta Gas Light Company.

The machine, which is the first industrial natural gas engine to be installed in Atlanta, will also be used for generating sufficient alternating electric current to operate a smaller ammonia compressor, motor driven auxiliary pumps and other equipment.

The lighting current for the plant will also come from the gas engine driven generator, gas lights being installed for occasional use in the office and on the loading platform when the refrigeration plant is shut down in winter. A high-speed 35-horsepower automobile type of engine is being installed for emergency use in driving the small compressor during light loads.

The gas consumption of the engine is estimated to be 6,000,000 cubic feet.

State Authority Defined

A state has the power to limit production of oil or natural gas from wells drilled in that state to any amount deemed the reasonable daily market requirement. And the state authorities also may, by law and administrative supervision, limit the production by each person or company taking from a common source of supply some ratable amount which will limit the total production to the reasonable current requirements for the gas or oil. This, in effect, is the decision of the Supreme Court of the United States on May 16. The decision was reached in a case brought against the authorities of the State of Oklahoma in which oil-land owners undertook to upset orders of the State Corporation Commission. The Supreme Court very clearly confirms these orders and denies that they deprive the well owners or operators of any property rights unreasonably.

The court has recognized that a person has a right to drill wells on his land and to take possession of the gas thereunder, including gas coming from under land belonging to others. It rules, however, that this right does not extend to the privilege of unreasonable production nor does it stop the state from preventing waste or excessive production. Under this decision, there is apparently no ground for doubt that state regulatory authority can be exercised so long as the decisions are "reasonable" and "non-discriminatory."

Gas Utility Sales Improve in March

Revenues of manufactured and natural gas utilities aggregated $62,009,931 in March, 1932, as compared with $64,318,405 in March, 1931, a decline of 3.6 per cent, according to reports from 406 companies serving 14,039,322 customers and representing over 90 per cent of the public utility distribution of manufactured and natural gas, it was announced recently by Paul Ryan, Chief Statistician of the American Gas Association.

This represents the smallest decline in revenues reported since May, 1931, and indicates a distinct improvement during the first three months of the current year. In January, 1932, revenues were 11.4 per cent below the preceding year, while in February the drop was only 5.7 per cent.

The manufactured gas companies reported revenues of $33,186,305 for March, a drop of 2 per cent from a year ago, while revenues of the natural gas concerns totaled $28,823,626, or approximately 5 per cent less than for March, 1931.

Sales of manufactured gas reported for March totaled 31,919,608,000 cubic feet, a decline of less than one per cent, while natural gas sales for the month were 64,577,188,000 cubic feet, a drop of 8 per cent.

A substantial part of the improvement in manufactured gas sales was due to the greatly augmented use of this product for househeating purposes. During March, 1932, sales of manufactured gas for this purpose aggregated 3,134,825,000 cubic feet which represents an increase of nearly 19 per cent over the corresponding month of the preceding year. This was in sharp contrast to the drop of nearly 4 per cent which characterized this class of business in February.

Throughout the country generally, industrial gas sales, both for manufactured and natural gas utilities, continued at levels considerably below the preceding year, the decline in sales of manufactured gas for industrial purposes approximating 9 per cent for the country at large, while industrial sales of natural gas were down nearly 9 per cent from March, 1931.

Applications Being Received for Charles A. Munroe Award

Recipients of the Charles A. Munroe Award form one of the most exclusive and honorary fraternities within the gas industry. Today, this fraternity has only three members. The three members have earned this distinction for accomplishments along entirely different lines.

The first Charles A. Munroe Award was presented in 1929 to Nils T. Sellman, of the Consolidated Gas Company of New York.

The second Charles A. Munroe Award went to J. L. Conover, of the Public Service Electric & Gas Company of Newark, N. J.

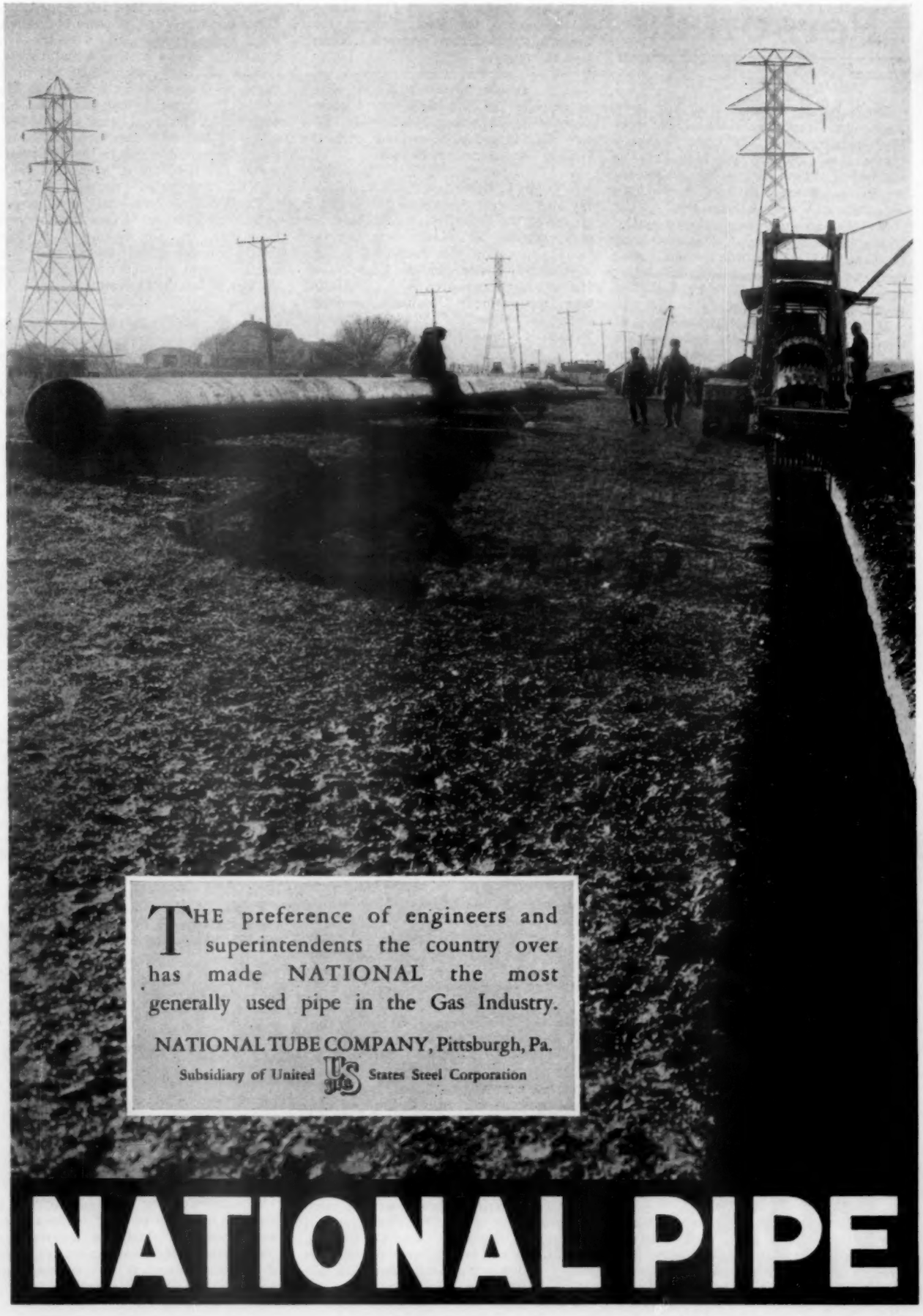
The third Charles A. Munroe Award was presented last year to Theodore V. Purcell, of The Peoples Gas Light and Coke Company, Chicago, Ill.

The Committee, consisting of Messrs. F. C. Freeman, president, Providence Gas Company, Providence, R. I., Chairman; N. C. McGowen, president, United Gas Public Service Corp., Houston, Texas; and Frank R. Phillips, president, The Philadelphia Company, Pittsburgh, Pa., is now entertaining applications for the 1932 Award. The recommendation of this committee will be presented to the Executive Board of the Association for approval.

Under the terms governing this Award, the most conspicuous contributions to the general interests of the gas industry may be presumed to include: Research, invention, operating methods or practices which reduce cost of manufacture and distribution, improved distribution or other service, increased sale of gas, development of new uses for gas, improved public and employee relations, promotion of safety, development of improved accounting practices, widening the field of gas-making materials, new methods of manufacture, finance, publicity, new gas works products and by-products, rates, etc., etc.

Applications for the 1932 Award consisting of a substantial financial recognition accompanied by an engrossed certificate, may be made by any individual or company member of the American Gas Association and should be filed with the Managing Director on or before August 1.

Answer to Starbuck's Rebus:—
Bringing back business is essentially a selling job.


THE preference of engineers and superintendents the country over has made NATIONAL the most generally used pipe in the Gas Industry.
NATIONAL TUBE COMPANY, Pittsburgh, Pa.
Subsidiary of United States Steel Corporation
NATIONAL PIPE

Personals

Frederick R. Wogan, who had been Assistant Secretary since 1910, was elected Secretary of The Brooklyn Union Gas Company on May 26th to succeed the late Henry E. McGowan. At the same time Richard B. Loomis was elected Assistant Secretary.

Mr. Wogan was first employed by the Fulton Municipal Gas Co. as secretary to General James Jourdan, then President of the Company and father of Mr. James H. Jourdan, present head of The Brooklyn Union Gas Co.

Mr. Wogan continued as secretary to General Jourdan through the formative and early years of The Brooklyn Union Gas Co. until October, 1910, when he was elected Assistant Secretary of the Company. He held this post until his recent promotion.

Mr. Loomis, who was born in Windsor, Conn., in 1902, was first employed by The Brooklyn Union Gas Company in 1924 as a clerk in the New Business Department. Six years later he was appointed Supervisor of Floor and Window Display in the New Business Department, the post he held at the time of his election as Assistant Secretary.

Mr. Loomis, who attended Clark University, graduated from Brooklyn Law School on June 9th.

William G. Woolfolk, consulting engineer of the American Light and Traction Company, succeeds R. B. Brown as president of the Detroit City Gas Company.

Samuel Insull recently retired as chairman of the Commonwealth Edison Company, the Peoples Gas Light and Coke Company and the Public Service Company of Northern Illinois. James Simpson, chairman of the board of Marshall Field & Co., was elected to succeed Mr. Insull as head of the three companies.

Aside from Mr. Insull's retirement and Mr. Simpson's succession, there will be no immediate changes in the operating personnel of the three companies, it is stated. Samuel Insull, Jr., will remain as vice-chairman of the companies, with E. J. Doyle remaining as president of Commonwealth Edison, George F. Mitchell as president of Peoples Gas and Britton I. Budd as president of Public Service of Northern Illinois.

Ronald A. Malony was recently appointed Assistant to the Sales Manager of the Philadelphia Gas Works Company, Philadelphia, Pa. Mr. Malony was director of appliance sales of The Philadelphia Electric Company.

J. H. Hodges has been appointed manager of the Sulphur, Okla. district of the Community Natural Gas Company. Mr. Hodges was formerly manager of the Pauls Valley district.

Walter Harris succeeds J. H. Hodges as manager of the Pauls Valley, Oklahoma, district of the Community Natural Gas Company.

L. S. Tessier, succeeds R. M. Nicoll as manager of Southern Gas Utilities, Inc., at San Marcos, Texas. Mr. Tessier was formerly connected with the United Gas Company, Boston.

William I. Battin succeeds J. Sanford Holt as general superintendent and engineer of the Seattle Gas Company, Seattle, Wash. Mr. Battin was assistant to the operating vice-president for gas in Central Public Service Corporation. He was also connected with the United Gas Improvement Company for many years, as well as the Peoples Gas Light & Coke Company, Chicago.

E. J. Stephany has been named director of personnel and claims for the Dallas Power & Light Company, Dallas, Texas. Mr. Stephany was formerly secretary of the Natural Gas Department of the American Gas Association and for many years associated with the gas and electric industries.

C. L. Trevitt has been named new business manager of the Community Natural Gas Company, Dallas, Texas. Mr. Trevitt succeeds S. E. Kerr who has been transferred to the tax department of the Lone Star Gas Company, Dallas, Tex.

David Edwards succeeds W. H. Strain, retired, as manager of the Tiffin, Ohio, plant of the Ohio Fuel Gas Company. Mr. Edwards was assistant industrial engineer at Fostoria, Ohio.

Benjamin K. Cook, formerly manager of North Adams Gas Light Company. Adams Gas Light Company, Williamstown Gas Company and Stamford Light, Heat and Power Company, was advanced to the position of vice-president of the North Adams Gas Light Company.

Herbert B. Southworth was named manager of the North Adams Gas Light Company, Adams Gas Light Company, Williamstown Gas Company and Stamford Light, Heat and Power Company, succeeding Benjamin K. Cook.

Charles H. Habfast, superintendent of Gas Distribution of the Burlington, N. J., Division of the Public Service Electric and Gas Company, was recently tendered a testimonial dinner in honor of his completing twenty-five years of service with Public Service. Mr. Habfast was presented with a gold service button.

Horatio Ray Milner succeeds the late Mr. C. J. Yorath as president and managing director of the Dominion Gas and Electric Company, Alberta, Canada. Mr. Milner will be in charge of the companies forming the Dominion Gas and Electric Company.

Philip Thornton Dashiell of the United Gas Improvement Company of Philadelphia, Pa., was presented with the Walton Clark Medal at the Medal Day exercises of The Franklin Institute of the State of Pennsylvania, held in the Hall of the Institute in Philadelphia on May 18th. Mr. Dashiell was awarded the Clark Medal in recognition of his outstanding contributions to the carburetted water gas industry as embodied in his fuel oil carburetion process.

The Walton Clark Medal was founded in 1926 by the United Gas Improvement Company, in honor of Dr. Walton Clark, former chief engineer of that company and for many years President of The Franklin Institute.

John W. McCardle has been re-elected chairman of the Indiana public service commission, this being his fourth term as president. He has been a member of the commission fifteen years, ten of which he has been president.

William R. Fargo has been named sales supervisor of the Northern Indiana Public Service Company at South Bend, Mr. Fargo was transferred from Hammond where he acted in the same capacity.

Henry P. J. Steinmetz, general sales manager, Public Service Electric and Gas Company, Newark, N. J., received his gold service badge recently, having completed twenty-five years with Public Service.

Mr. Steinmetz started with Public Service as a stenographer in the auditing department, Newark, in 1907.

B. M. Laulhere, formerly superintendent of construction for Southern Fuel Company, has been named supervising engineer of the Southern California Gas Company, Los Angeles. Mr. Laulhere will be in direct charge of all engineering, construction, gas measurement, transportation, and chemical research and testing.

Ralph L. Cook has been appointed superintendent of the Basin Division of the Southern California Gas Company.

W. M. Jacobs was recently appointed to the position of Assistant Industrial Engineer of the Eastern Division of the Southern California Gas Co., with headquarters at San Bernardino, California.

Milton L. Kapp was recently appointed supervisor of district operations of the Oklahoma Natural Gas Corporation, Tulsa, Okla. Mr. Kapp was formerly manager of the Oklahoma City district of the company.

Thomas Sterling succeeds Milton L. Kapp as manager of the Oklahoma City district of the Oklahoma Natural Gas Corporation. Mr. Sterling was manager of the Enid district. He is succeeded there by Mr. C. Harry Sacher.

Ten Reasons for Roberts superiority

TEN FEATURES OF THE ROBERTS CONTROLLED GAS HEATING UNIT

1. Complete Air Control prevents cold air entering and cooling fire pot when the burner is not in operation.
2. Roberts Burners minimize excess air, by directing all air to point of combustion.
3. China Clay Radiants direct heat against walls of fire pot.
4. Special Steel Mixing Tubes permit 30% higher injection of air than cast iron.
5. Preheated Air Increases Combustion Efficiency.
6. Automatic Pilot insures gas shut off in case of gas or electric failure.
7. Motor Valve operated by Room Thermostat.
8. Emco Gas Pressure Regulator.
9. Highest Quality insures long life with low maintenance cost.
10. Listed as Standard by the Underwriter's Laboratories in the U. S. A. —in Canada by the Hydro-Electric Power Commission.

ROBERTS-GORDON APPLIANCE CORPORATION

BUFFALO, NEW YORK

Factories at 21st and X Streets, Lincoln, Neb., and Buffalo, N. Y.

ROBERTS
CONTROLLED
GAS HEATING UNIT

Obituary

HENRY E. McGOWAN

Henry E. McGowan, secretary of The Brooklyn Union Gas Co., died May 7th after a short illness. He was in his 60th year and had been secretary of the Brooklyn utility company since 1917.

Born in Brooklyn on October 3, 1872, Mr. McGowan was graduated from Stevens Institute of Technology in 1894 with the degree M. E. He entered the employ of the Brooklyn Union Gas Co. in 1898 as Electrical Engineer. Five years later, in 1903, he was appointed general manager of the Flatbush Gas Co., a subsidiary of the Brooklyn Union.

His success with the Flatbush company earned him the promotion to assistant secretary of The Brooklyn Union Gas Co. in 1914. Three years later he was appointed secretary of the company.

Mr. McGowan was a member of the Crescent Athletic-Hamilton Club, the Brooklyn Chamber of Commerce, the American Gas Association, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the Empire State Gas and Electric Association.

ROBERT M. FEUSTEL

Robert M. Feustel, president of the Midland United Company, and an officer and director of various subsidiaries of that company, died of nephritis Sunday, May 8, at Fort Wayne, Ind., where he made his home.

Mr. Feustel was actively engaged in the public utility business as an operator, management executive, state commission engineer and consulting engineer from the time of his graduation from Purdue University in 1905.

He was born at Fort Wayne August 5, 1884. He received his preliminary education in the public schools of Fort Wayne and later entered Purdue University from which he was graduated in 1905 with a B. S. degree, taking his C. E. from the same university in 1909. He began his professional career as assistant engineer with the Fort Wayne and Wabash Valley Traction Company at Fort Wayne in 1905.

In 1907 he became assistant engineer of the Railroad Commission of Wisconsin and there gained training with the first state public utility regulatory body given mandatory power over rates and service. He became assistant chief engineer of the Wisconsin Commission in 1911. When the Public Utilities Commission of Illinois was created in 1913, he was called to that state to become its first chief engineer and in that capacity organized its engineering department.

Mr. Feustel left commission work in 1915 to engage in private consulting engineering which he continued until 1929.

ARCHIBALD S. B. LITTLE

Mr. Archibald S. B. Little, engineer and public utility rate expert, long associated with the Franchise Bureau in the office of the Corporation Counsel of New York, died Thursday, May 11, 1932, at the Brunswick General Hospital in Amityville, N. Y. He was 53 years old.

Mr. Little, who was born in Dumbarton, Scotland, on August 30, 1879, coming to the United States in 1902, appeared as an expert for New York City in virtually all the public utility cases involving rate controversies and other matters since 1919 and had a wide reputation as an authority on gas, electric light and telephone utilities. He was the author of numerous works on the subject, including "Valuation of Public Service Property" and "Purification of Gas." He was a frequent contributor to engineering and technical magazines and papers, and was the inventor of the Webber-Little system of producing gas.

He was a member of the following Clubs: Army & Navy, N. Y. C.; Seaview Golf Club (Atlantic City), and Hempstead Country Club.

Surviving are his widow, Mrs. Lydia S. Little; a daughter, Mrs. Dorothy Beardsley; a sister, Marion Little, of Worcestershire, England, and three brothers, Mathew Little, of Worcestershire, England; Gilbert Little, of Atlanta, and Patrick Little, of Kenosha, Wis.

JAMES DAWSON CALLERY

James Dawson Callery, one of the organizers and former vice-president of the Philadelphia Company, died recently at his home in Pittsburgh, Pa. He was 74 years old.

Mr. Callery was closely identified with utility companies throughout his entire active business career and at the time of his death was a director of the Philadelphia Company, chairman of the boards of the Pittsburgh Railways Company and the Equitable Gas Company, and a director of the Duquesne Light Company, Allegheny County Steam Heating Company and the Beaver Valley Traction Company. He was also president of the Diamond National Bank and of the Baragua Sugar Company.

Mr. Callery was born in 1858 in Allegheny. He was educated in the Pittsburgh public schools and at Notre Dame University.

TRADE NEWS

United Engineers & Constructors, Inc. Activities

Consumers Gas Company of Reading, Penna., has awarded contract to furnish and install one (1) 250,000 cu. ft. capacity per hour gas compressor, together with foundations and auxiliary piping and equipment.

Changes in Roots-Connersville-Wilbraham Agency Addresses

E. A. McCallum, representing Roots-Connersville-Wilbraham, Connersville, Ind., manufacturers of blowers, pumps and meters, has removed from Los Angeles to San Francisco and is now located in Room 620, Hearst Building.

Other recent changes in addresses of Roots-Connersville-Wilbraham representatives are as follows: B. T. Ehrnman is now located at 3300 Morganford Road, St. Louis; and C. B. Coldwell has relocated the Texas office at 307 Southland Life Insurance Bldg., Dallas.

New York and Chicago addresses are 420 Lexington Ave. and 20 N. Wacker Drive respectively. W. S. Guitteau heads the staff in New York, and Wm. Townsend is Chicago manager.

M-S-A Combustible Gas Indicator

Mine Safety Appliance Co., Pittsburgh, Pa., have issued a four page bulletin describing their M-S-A Combustible Gas Indicator. Illustrations show it is used in various kinds of testing operations. It is a direct reading instrument and is of interest to public utilities, by-product plants, oil companies and chemical works.

New Wizard Pilot Unit

The Fisher Governor Company, Marshalltown, Iowa, have issued Bulletin 70 announcing the development of the Series 4200 Wizard Pilot Unit which involves a new design that includes the pilot valve as an integral part of the main valve top work. This unit utilizes auxiliary air or gas as an operating medium and is suitable for all pressure conditions of 5 pounds and up.

The unit is easily converted from a pressure reducing valve to a pressure relief valve by a very simple change made in the pilot valve.

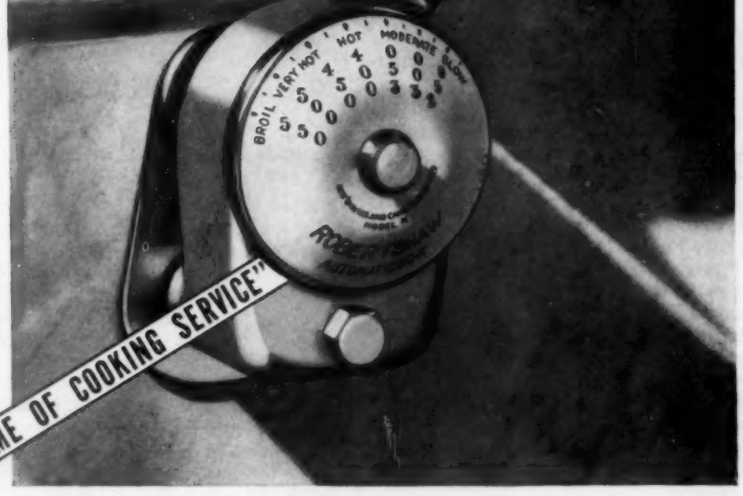
It is furnished complete with a small auxiliary regulator and with pressure gauge.

This unit is, at the present time, being used extensively in many refinery operations where extremely close limits of regulation must be maintained. It is claimed with the new design incorporating the pilot with the main valve, the elimination of time lag has been accomplished, making the valve immediately responsive to the slightest command of the Wizard Pilot.

(Trade News continued on page 56)

ROBERTSHAW

"AutomatiCook"



CASH IN on ROBERTSHAW DEMAND

"THIS CONTROL ASSURES A LIFETIME OF COOKING SERVICE"

MODEL "K"
FOR
CONSOLE
RANGES

The Robertshaw, both directly and indirectly, has helped you sell more gas ranges every year during the past ten years.

For it is the Robertshaw, and the Robertshaw advertising campaign, that starts women thinking about a new range.

This year, when you need all the sales assistance you can get, why not cash in on the Robertshaw campaign to the very limit?

Just drop us a letter and we will tell you how to do it!

MODEL "F"
FOR TABLE TOP AND
CONSOLE RANGES

ROBERTSHAW THERMOSTAT CO.

YOUNGWOOD, PA.

A.G.A. Approves Bullard Universal Hose Mask

The American Gas Association has approved the Bullard Universal Hose Mask. This mask as previously announced is recommended for use in atmospheres containing low concentrations of oxygen and high percentages of gas. The Bullard Universal Hose Mask is being manufactured in both one-man and two-men outfits with single or double inhalation tubes as preferred.

Each mask is furnished with the new Bullard one-piece moulded face piece made of specially compounded rubber which it is stated, will not oxidize or lose its elasticity. The manufacturing processes are subject to constant supervision in the Bullard Laboratory at all times.

Bulletin on Bastian-Blessing Liquefied Petroleum Gas Equipment

The Bastian-Blessing Company, Chicago, Ill. have recently issued a bulletin regarding improvements and prices on their liquefied petroleum gas equipment. This includes data on revised schedule of price, refinements in cylinder and manifold valves, in safety releases for liquefied petroleum gas regulators, flat rate schedule of prices for repairing Bastian-Blessing cylinder and manifold valves, improvements in liquefied petroleum gas regulators, blueprints of revised outfits and cylinder valves and memorandum outlining differences between the various outfits and various valves.

Copies of this bulletin will be mailed on request.

New Worthington Catalogs

The Worthington Pump and Machinery Corp., Harrison, N. J., have just released the following catalogs, bulletins, etc.

Multi-V-Drives (Rubberized cord belts operating in V-grooved sheaves). 12-page bulletin L-400-B2A.

Rock Drills—4-page bulletin W-1200-B2 covering drills for mines and quarries. 4-page bulletin W-1200-B3 covering drills for contractors.

Air Compressors, Vertical Single-cylinder, Two-stage, 10.7 to 61 cu. ft. per minute displacement—4 page bulletin L-620-S2.

Diesel Engines, Stationary—6-page bulletin S-500-S2 covering 50 hp. to 150 hp. sizes; 6-page bulletin S-500-S1 covering 225 hp. to 450 hp. sizes.

Diesel Engines, Marine—6 page bulletin S-500-S7, covering 50 hp. to 150 hp. sizes.

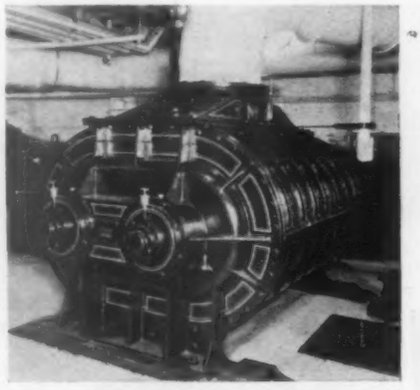
Gas Engines, Vertical 4-cycle—6 page bulletin S-550-S3 covering 270 hp. to 540 hp. sizes; 6-page bulletin S-550-S2 covering 450 hp. to 1200 hp. sizes.

Water Meters, Disc Type——8-page bulletin W-900-B9, covering ⅝-inch to 2-inch sizes.

Copies of any of these publications will be sent upon request.

R-C-W Blowers to Operate Pneumatic Tube System

Roots-Connersville-Wilbraham, Connersville, Ind., recently completed an installation of four R-C-W blowers in the department store of R. H. Macy & Company, Inc., New York, to operate their pneumatic tube system, consisting



Two of the four R-C-W Blowers installed at R. H. Macy & Co., Inc.

of over 800 tube lines. The system consists of four R-C-W Blowers with a combined capacity of 85,600 cu. ft. of air per minute at 1.1 lbs. vacuum, driven by two 125 Hp. motors and two 100 Hp. motors. With this equipment it is possible to operate the system with any three blowers, without overloading, even when ultimate capacity of 1000 tube lines is reached.

The tremendous number of transactions handled by this system is more easily visualized when it is realized that over 90% of the annual sales of $100,000,000.00 are handled through tubes.

Rotary positive blowers, were selected in preference to other type after officials of R. H. Macy & Co. had made a comparative test of efficiency.

Bastian-Blessing Introduces New Line of Welding Rods

Under the trade name of RegOroD, The Bastian-Blessing Company, Chicago, has recently introduced a new line of welding rods and electrodes to be sold through their nation-wide organization of Rego Distributors.

Scientific research and careful field tests have been made in the development of this line of rods. The line includes every popular type of rod such as high speed and high test materials.

The new RegOroD catalog is prepared in pocket size and not only gives a complete description of each rod but gives valuable information in reference to the proper rod for use in specific applications. It also contains a number of valuable tables for the use of the welder and welding engineer.

The Bastian-Blessing Company or any Rego Distributor will be glad to furnish on request a copy of this catalog and handbook.

J. S. Tritle Elected Vice-President at Westinghouse Supply Company

J. S. Tritle has been elected vice-president in charge of operations of the Westinghouse Electric Supply Company, wholesale distributor of Westinghouse products to electrical dealers, contractors and industrial establishments. He will assume his new duties immediately in addition to his present position, vice-president and general manager of the Westinghouse Electric and Manufacturing Company.

Move Offices

Ralph E. Davis, Inc., Engineers, announce the removal of their offices to 150 Broadway, New York.

Oxweld Prices Reduced

The Linde Air Products Company, 30 East 42nd Street, New York, N. Y., announces that substantial reductions in the prices of Oxweld Welding and Cutting Blowpipes are now in effect.

One of the major items of apparatus affected by this change is the Oxweld Type W-17 Welding Blowpipe. A low pressure injector type of blowpipe, it may be used with any source of acetylene, producing a soft, low velocity flame and maintaining the desired type of flame without further adjustment during the welding operation. Although extremely light, the body is of rugged, durable construction, the handle being ribbed to make it resistant to dents as well as easier to grip. Both one-piece and detachable-tip welding heads are available.

Relatively inexpensive accessories make the W-17 an all-purpose blow-pipe with a complete oxy-acetylene range. The Type CW-17 Cutting Attachment, the price of which has also been reduced, attaches directly to the W-17 Handle and provides a means of cutting steel up to 3 in. in thickness. An adaptor makes it possible to use Oxweld Sheet Metal Welding Heads on the W-17 Handle, providing a complete range of sheet metal welding work. Extra long welding heads are available so that the blowpipe may be used for heavy, preheated work, with the operator at a comfortable distance from the work.

Along with other price reductions in Oxweld Blowpipes, the Oxweld Type C-14 Cutting Blowpipe is being offered at a new low price. This blowpipe, with a complete cutting range, may be used either with a low pressure injector of a medium pressure mixer nozzle.

Move New York Office

General Gas Light Co., Kalamazoo, Mich., have moved their New York office from 44 West Broadway to 23 Warren Street, New York City.

SUPERIOR

Gas Meters
Provers
Service Cleaners
Diaphragms
Repairs

SUPERIOR METER CO.
167-41st Street
Brooklyn, N. Y.

BAROMETERS

PHILADELPHIA, THE WORKSHOP OF THE WORLD
has 14,000 Manufacturing Establishments of which many have World-Wide Reputations.

"PRINCO" STANDARD FORTIN MERCURIAL BAROMETERS

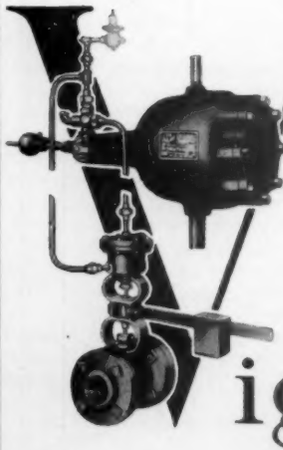
are in World-Wide use because they, too, have a "World-Wide Reputation"

THEY ARE GOOD BAROMETERS
THEY ARE REASONABLE IN PRICE

For more than a decade they have been made in such manner that they can be shipped safely and successfully wherever there is a common carrier. This has been recognized as an achievement in Barometry.

PRECISION THERMOMETER & INSTRUMENT COMPANY

1439 BRANDYWINE STREET - - - - - PHILADELPHIA, PA.



V-port VALVE

C-F

Vigilant

FOR quiet operation at all times when demands are fluctuating, for sure and exact regulation under light loads as well as heavy, a Vigilant Liquid Level Regulator with V-port Valve is recommended. Wide-open, it has a capacity equal to that of the pipe. When flow is at minimum, the distance between valve and seat is still enough to assure free action.

There is a C-F regulator exactly suited, to every requirement of gas control. Well known for more than 40 years. Catalog on request.

The Chaplin-Fulton Mfg. Company

ORGANIZED 1884—OLDEST BUILDERS OF GAS REGULATORS IN THE COUNTRY. BUILT IN ALL SIZES FROM 1 INCH TO 24 INCHES; FOR ALL SERVICE, 1 OZ. UP TO 2,000 LBS. PRESSURE TO SQUARE INCH.

28-40 Penn Avenue Pittsburgh, Pa.

TRADE CATALOGS

Published by manufacturers of Gas Equipment and Appliances for you. Order by number, using coupon on Page 64.

PLANT EQUIPMENT

"AMERICAN" GAS AND METER TESTING APPARATUS
American Meter Co. 320

AUTOMATIC GOVERNORS
Connelly Iron Sponge & Governor Co. 289

BALANCE GOVERNORS
Connelly Iron Sponge & Governor Co. 290

BACK PRESSURE VALVES
Connelly Iron Sponge & Governor Co. 295

B. H. CO. OSCILLATING CONTINUOUS FILTER
The Bartlett Hayward Co. 701

B. H. CO. THICKENER
The Bartlett Hayward Co. 56

B. H. CO. VERTICAL SCRUBBER
The Bartlett Hayward Co. 57

B. H. CO. FELD TYPE SCRUBBER
Bartlett Hayward Co. 713
Co. 580

"BULLETS"—HOLDERS
Stacey Bros. Gas Constrn. Co. 560

BUTANE PLANT EQUIPMENT
Philgas Co. 510

CALORIMETRY
American Meter Co. 321

CALOROPTIC, THE
Connelly Iron Sponge & Governor Co. 511

CHEMICAL ANALYSIS OF GAS PURIFYING MATERIALS
E. J. Lavino & Co. 455

CHEMISTRY AND PHYSICS OF THE COMBUSTION OF GASEOUS FUELS
E. J. Lavino & Co. 456

CONNELLY COMBINATION VALVE
Connelly Iron Sponge & Governor Co. 610

CONTROL MECHANICAL APPARATUS
Western Gas Construction Co. 581

COUNTER BALANCE MANHOLES
Connelly Iron Sponge & Governor Co. 299

DISTRICT L. C. GOVERNORS
Connelly Iron Sponge & Governor Co. 293

DR. OTT-LUX-GAS TESTER
The Alpha Lux Co., Inc. 23

DUPLEX VALVES
Andale Co. 45

FAST S FLEXIBLE COUPLING
The Bartlett Hayward Co. 54

FULTON DEAD WEIGHT SAFETY VALVES
Chaplin-Fulton Mfg. Co. 480

FULTON LEVER SAFETY VALVES
Chaplin-Fulton Mfg. Co. 479

GAS CONDENSERS
Isbell Porter Co. 140

GAS COOLER
Andale Co. 46

GAS DISTRIBUTION
The U. G. I. Contracting Co. 654

GAS FILTERS
American Meter Co. 322

GAS PURIFICATION PROCESS
Western Gas Construction Co. 585

GAS HOLDERS—HIGH AND LOW PRESSURE
Stacey Mfg. Co. 579

GAS MEASUREMENT
American Meter Co. 323

GATE VALVES
Western Gas Construction Co. 586

GAS WORKS APPARATUS AND EQUIPMENT
Connelly Iron Sponge & Governor Co. 627

HAND COLORIMETER
The Alpha Lux Co., Inc. 22

HIGH EFFICIENCY GAS CONDENSERS
Isbell Porter Co. 137

HIGH TEST WELDING ROD
Union Carbide & Carbon Corpn. 255

JET PHOTOMETERS
Connelly Iron Sponge & Governor Co. 291

KEEPING UP WITH INDUSTRY
Cruse Kemper Co. 457

KENNEDY AUTOMATIC CONTROL
The Bartlett Hayward Co. 55

LABORATORY APPARATUS
American Meter Co. 324
Superior Meter Co. 521

LUX RECORDING GAUGE
The Alpha Lux Co., Inc. 21

MACKENZIE EXHAUSTERS
Isbell Porter Co. 653

MANUAL OF DRY BOX PURIFICATION
E. J. Lavino and Co. 276

MERCURY SEAL GOVERNORS
Connelly Iron Sponge & Governor Co. 291

METERS, GAS
American Meter Co. 326
Superior Meter Co. 522
Roots-Connersville-Wilbraham —
International-Stacey Corpn. 702
Sprague Meter Co. 710

"METRIC" IRONCASE METERS
American Meter Co. 325

OBSERVATION ON LUX-MATERIAL
The Alpha Lux Co., Inc. 24

ORIFICE METERS
American Meter Co. 327

PRESSURE GAUGES
Connelly Iron Sponge & Governor Co. 296
American Meter Co. 378
Superior Meter Co. 525

PRESSURE VACUUM RELIEF VALVE FOR STORAGE TANKS
International-Stacey Corpn. 642

RELIANCE SERVICE REGULATORS
Isbell Porter Co. 139

ROADLESS BARROWS
Isbell Porter Co. 655

ROTARY SELF-CLEANING STRAINER
Andale Co. 656

SECTIONAL SIDE-WALL CONSTRUCTION
International-Stacey Corpn. 643

SERVICE CLEANERS
American Meter Co. 657
Superior Meter Co. 521

SERVICE GOVERNORS
Connelly Iron Sponge & Governor Co. 658

SERVICE D. C. GOVERNORS
Connelly Iron Sponge & Governor Co. 294

SEMET-SOLVAY KOLLER TYPE GAS PRODUCER
Semet Solvay Engineering Corpn 714

SHAVING SCRUBBERS
Isbell Porter Co. 138

SPECIFICATIONS ON HIGH AND LOW PRESSURE HOLDERS
The Stacey Bros. Gas Constrn. Co. 74

"STACEY BULLET"
The Stacey Bros. Gas Constrn. Co. 73

STACEY-KLONNE DRY GAS HOLDERS
Stacey Bros. Constrn. Co. 644

STANDARD HOLDERS FOR LOW PRESSURE STORAGE
Western Gas Construction Co. 580

STANDARD STEEL BUILDINGS
International-Stacey Corpn. 645

STEEL DERRICKS AND ACCESSORIES
International-Stacey Corpn. 646

STREET DEPARTMENT TOOLS
Connelly Iron Sponge & Governor Co. 297

STREET MAIN GOVERNORS
Isbell Porter Co. 134

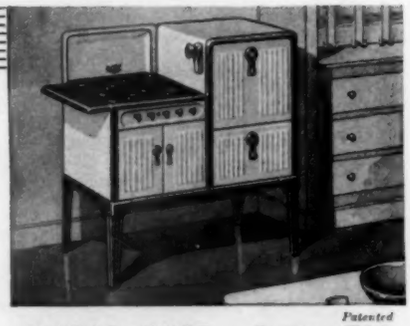
THROTTLE GOVERNORS & COMPENSATORS
Isbell Porter Co. 662

U. G. I. BARRING DOWN MACHINE, THE
The U. G. I. Contracting Co. 663

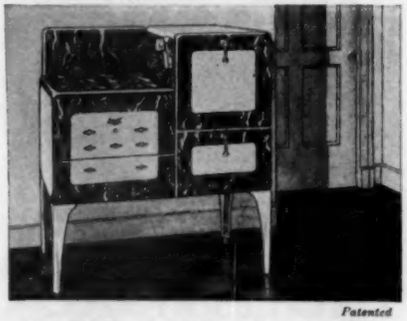
(Continued on page 60)

Magic Chef
AMERICAN STOVE COMPANY

A COMPLETE LINE
that meets every buying requirement



Patented
MAGIC CHEF • Series 700



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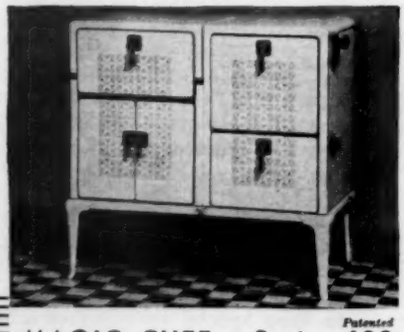
MAGIC CHEF • Series 500



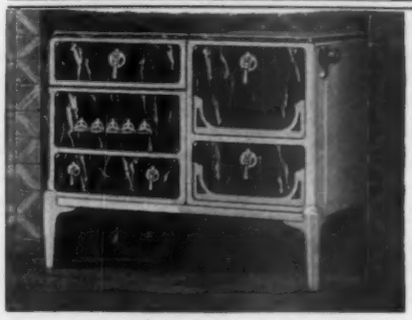
Patented
MAGIC CHEF • Series 600

• With the Magic Chef line the dealer can blanket the gas range market in his territory. Instead of merely a single gas range of limited appeal, Magic Chef is a completely balanced line of related models that meets every buying requirement of size, design, taste and price. To further strengthen the dealer's position, the Magic Chef line has advanced features of efficiency, convenience and economy found in no other gas range.

• These features include the famous Red Wheel Oven Heat Regulator . . . safety type gas valves . . . specially designed three-in-one non-clog top burners, efficient at every point from simmering heat to hot, fast fires . . . the sanitary high burner tray which conceals pipes and valves and protects them from spattering grease . . . Magic Chef Automatic Top Burner Lighter . . the distinctive cooking top covers . . the smooth, sanitary oven linings . . . the rackless, reversible broiler pan which reduces chances of fats catching fire . . . the broiler extension carriage.

• Added to these advantages the Magic Chef dealer shares the benefits of extensive national advertising and the sales-winning prestige of Magic Chef leadership in the gas range field.

Look for the RED WHEEL
when you buy a MAGIC CHEF



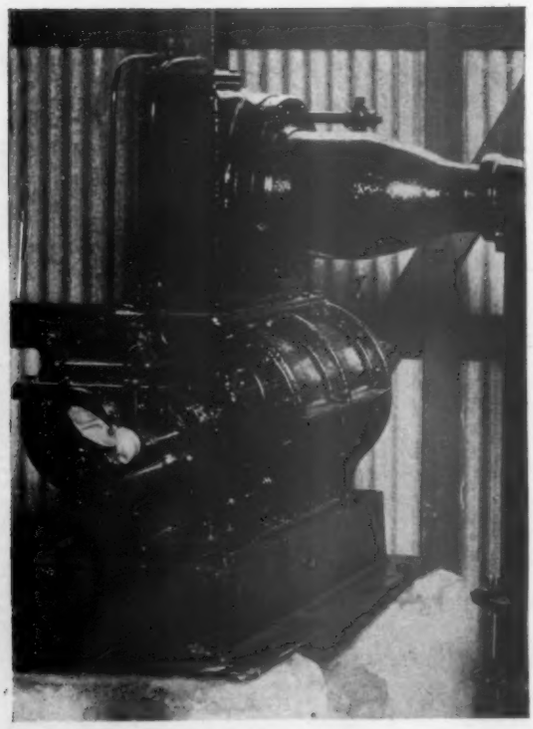
Patented
MAGIC CHEF • Series 29

AMERICAN STOVE COMPANY

World's Largest Manufacturer of Gas Ranges

NEW YORK · PHILADELPHIA · ATLANTA · CLEVELAND
CHICAGO · ST. LOUIS · LOS ANGELES · SAN FRANCISCO

DEPENDABLE



INDUSTRIAL METERS

CONNERSVILLE Rotary Displacement Meters, by accurately measuring the quantities of gas sold, and consumed, meet the requirements of both the gas company and the consumer in such contracts, and eliminate any dispute with regard to the accuracy of the measurement of the gas consumed.

Connersville Meters are widely used in both natural and manufactured gas metering. While the recording equipment furnished with the meter gives a direct reading, it is sometimes desirable to keep special records, requiring accessory apparatus.

When such an arrangement is desired, we can supply pressure-volume-temperature-time recorders, demand recorders, or such other necessary equipment as your installation requires. Literature forwarded on request.

ROOTS - CONNERSVILLE - WILBRAHAM
12th and Columbia CONNERSVILLE, INDIANA

20 N. Wacker Drive
Chicago, Ill.

420 Lexington Ave.
New York, N. Y.

ROTARY POSITIVE CENTRIFUGAL RCW

TRADE CATALOGS

(Continued from page 58)

U. G. I. INTERMITTENT CHAMBER OVENS
The U. G. I. Contracting Co. 75

U. G. I. MECHANICAL GENERATOR AND CHARGER, THE
The U. G. I. Contracting Co. 79

U. G. I. MODEL "B" AUTOMATIC CONTROL, THE
The U. G. I. Contracting Co. 78

VALVES
The Western Gas Construction Co. 86

WATER GAS
The Western Gas Construction Co. 89

WATERLESS GAS HOLDERS
The Bartlett Hayward Co. 58

WEST GAS
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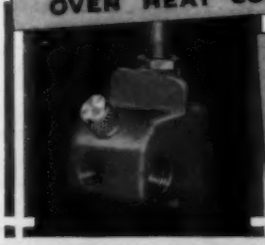

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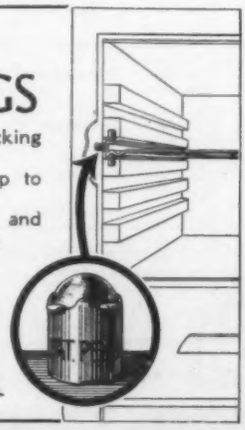

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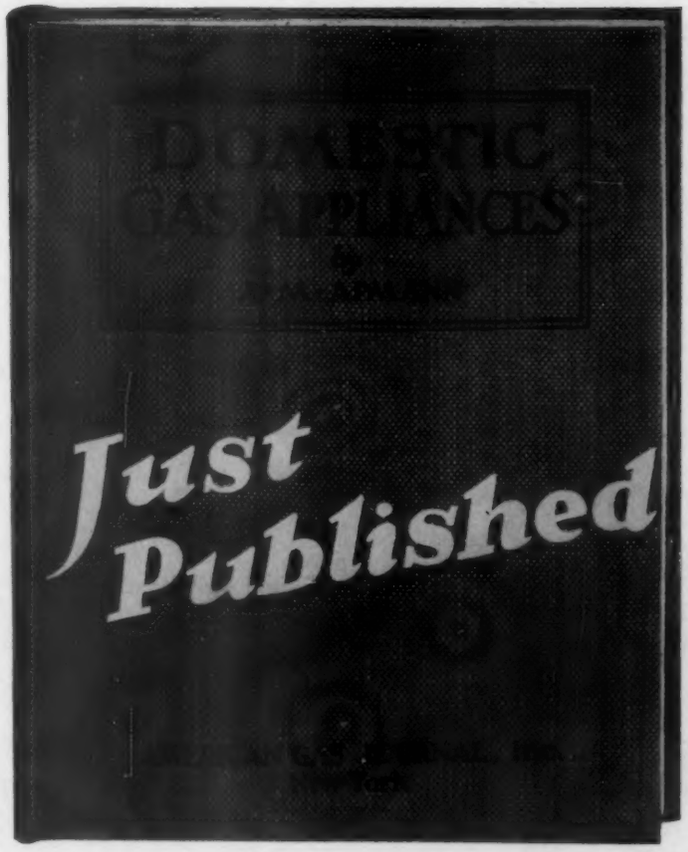

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